

FROM THE *NEW YORK TIMES*
BESTSELLING AUTHOR OF *THE ELEMENT*

KEN ROBINSON

"BRILLIANT" —JOHN CLEESE

OUT *of* OUR MINDS



Learning to be Creative

{ NEW EDITION, FULLY UPDATED }

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OUT OF OUR MINDS

OUT OF OUR MINDS

Learning to be creative

FULLY REVISED AND UPDATED EDITION

SIR KEN ROBINSON

“Ken Robinson writes brilliantly about the different ways in which creativity is undervalued and ignored ...”

John Cleese



CAPSTONE

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For Terry, who makes everything possible.

IN PRAISE OF *OUT OF OUR MINDS* (1ST EDITION)

“Out of Our Minds *explains why being creative in today’s world is a vital necessity. This is a book not to be missed. Read and rejoice.*”

Ken Blanchard, Co-author, The One Minute Manager and The Secret

“*If ever there was a time when creativity was necessary for the survival and growth of any organization, it is now. This book, more than any other I know, provides important insights on how leaders can evoke and sustain those creative juices.*”

Warren Bennis, Distinguished Professor of Business, University of Southern California; Thomas S. Murphy Distinguished Research Fellow, Harvard Business School, best-selling author, Geeks and Geezers

“*This really is a remarkable book. It does for human resources what Rachel Carson’s Silent Spring did for the environment. It makes you wonder why we insist on sustaining an education that is narrow, partial, entirely inappropriate for the 21st century and deeply destructive of human potential when human beings have so much latent creative ability to offer. A brilliant analysis.*”

Wally Olins, Founder, Wolff-Olins

“*The best analysis I’ve seen of the disjunction between the kinds of intelligence that we have traditionally honored in schools and the kinds of creativity that we need today in our organizations and our society. I learned a lot.*”

Howard Gardner, A. Hobbs Professor in Cognition and Education, Harvard Graduate School of Education; best-selling author, Frames of Mind

“*Books about creativity are not always creative. Ken Robinson’s is a welcome exception: a set of wide ranging, provocative and useful reflections for anyone concerned with bringing new ideas to fruition in business, academia, or the arts.*”

Mihaly Csikszentmihalyi, C.S. and D.J. Davidson, Professor of Psychology, Claremont Graduate University; Director, Quality of Life Research Center; best-selling author, FLOW

“*If you would like to start to unlock the inherent creativity that exists in every human being (including you), then start ... by reading this book!*”

Simon Woodroffe, founder Yo Sushi

“*Ken Robinson’s is an original and creative mind. I can think of no better spokesperson on creativity. His views are as much directed to learning institutions as they are to industry. Out of Our Minds is a genuine challenge to complacency.*”

Ruth Spellman, Chief Executive, Investors in People, UK

“*I definitely want to meet Ken Robinson. I have a great affinity with the ideas he proposes. His writing is witty, sometimes caustic, and he supports his arguments with evidence and research. Robinson points us towards a future where young people must be enabled to unleash their creativity and deal with change through a different and better education system. As someone who gains a living from management development, this is all too evident to me. Robinson makes powerful arguments for change. I recommend that you read this book, take part in the debate and become part of the paradigm.*”

People Management

“*For a book called Out of Our Minds, Ken Robinson’s illuminated assault on the current state of academic education is actually a very sane read. The current obsession is not only failing businesses but also our children. Robinson is right on the money.*”

Arts Professional

“*Out of Our Minds has a powerful agenda – how to solve the appalling lack of skills in a world demanding ever more brainpower. This is a thoughtful book that does not dodge such cruel paradoxes of our time as the fact that standards of living get higher while the quality of life declines: a truly mind-opening analysis of why we don’t get the best out of people in a time of punishing change.*”

“This is a deeply significant work in this area – I am really impressed with the historical perspectives and breadth of insights drawn from the arts, sciences, psychology and many other fields. It is an immensely powerful statement of the current educational situation and highlights very powerfully the need for transformed thinking from top to bottom.”

Creative-Management

“Out of Our Minds calls for radical changes in the way we think about intelligence, education and human resources, in order to meet the extraordinary challenges of living and working in the 21st century. This book will make compulsive reading for anyone who shares an interest in the future of creativity, education and training.”

Center for Creative Communities

“Sometimes a writer has an uncanny knack of sharply focusing something, which up until then you had not seen in all its simplicity and brilliance. This book does that but at the next moment it makes connections never before imagined ... Even the most obstinately prosaic and safe thinkers will be tempted out of their box by Ken Robinson’s ideas, theories and speculations. What’s more, he writes as he speaks, in a way that, magnetically and compulsively, is simply irresistible.”

Professor Tim Brighouse

“There are certain books that manage to be authoritative, entertaining and thought-provoking and are also well written and richly exemplified. Few authors are able to fashion this attractive mixture. Alvin Toffler and Charles Handy can craft it. I add Ken Robinson’s absorbing account of creativity to my personal list of gems. Creativity is one of those topics that excites some and enrages others. For Ken Robinson it is a universal talent that all people have, often without realizing it. Society in general and education in particular, can squash the imagination and rock self-confidence. I was sorry to reach the end of the text, as it had maintained its momentum throughout. The reading may finish, but the thinking goes on, just as you would expect from a book on this intriguing subject.”

Professor Ted Wragg

ABOUT THE AUTHOR

SIR KEN ROBINSON, PHD is an internationally recognized leader in the development of creativity, innovation and human resources. He has worked with governments in Europe, Asia and the USA, with international agencies, Fortune 500 companies, and some of the world's leading cultural organizations. In 1998, he led a national commission on creativity, education and the economy for the UK Government. "All Our Futures: Creativity, Culture and Education" (*The Robinson Report*) was published to wide acclaim in 1999. He was the central figure in developing a strategy for creative and economic development as part of the Peace Process in Northern Ireland, working with the ministers for training, education enterprise and culture. He was one of four international advisors to the Singapore Government for its strategy to become the creative hub of South East Asia.

For twelve years, he was Professor of Education at the University of Warwick in the UK and is now Professor Emeritus. He has received honorary degrees from the Open University, the Central School of Speech and Drama, Birmingham City University, Rhode Island School of Design, Ringling College of Art and Design and the Liverpool Institute for Performing Arts. He has been honored with the Athena Award of the Rhode Island School of Design for services to the arts and education; the Peabody Medal for contributions to the arts and culture in the United States, and the Benjamin Franklin Medal of the Royal Society of Arts for outstanding contributions to cultural relations between the United Kingdom and the United States. In 2005 he was named as one of *Time/Fortune/CNN*'s Principal Voices. In 2003, he received a knighthood from Queen Elizabeth II for his services to the arts. He speaks to audiences throughout the world on the creative challenges facing business and education in the new global economies. His renowned talks at the annual TED conference (2006 and 2010) continue to be viewed by many millions of people around the world.

Sir Ken was born in Liverpool, England as one of seven children. He is married to Therese (Lady) Robinson. They have two children, James and Kate, and live in Los Angeles, California.

Also by Sir Ken Robinson: *The Element: How Finding Your Passion Changes Everything* (Penguin/Viking 2009) is a *New York Times* Best Seller, which has been translated into 20 languages.

PREFACE

“We will not succeed in navigating the complex environment of the future by peering relentlessly into a rear view mirror. To do so, we would be out of our minds.”

CREATIVITY IS THE GREATEST GIFT of human intelligence. The more complex the world becomes, the more creative we need to be to meet its challenges. Yet many people wonder if they have any creative abilities at all. *Out of Our Minds* is about why creativity matters so much, why people think they are not creative, how we arrived at this point, and what we can do about it. The first edition of this book was published in 2001. What you have in your hands now is a completely new and revised edition. So, why a new edition, and how new is it, really?

I wrote the original edition of *Out of Our Minds* during 2000. The first reason for a new edition is that so much has happened since then, both in *the* world and in *my* world. On almost every front, the pace of change has become ever more frantic and the issues at the heart of this book have become more pressing. Consider the rate of change in technology. Ten years ago, the Internet was still a novelty for most people. There were no smart phones, iPods; no Facebook, Twitter, YouTube or most of the social media sites that are now transforming culture and economics around the world. Many other things have happened too – from the global impact of the events of 9/11 to the compounding effect of the Great Recession – that simply could not have been anticipated ten years ago: in politics, the economy, in culture and in the environment. The sheer unpredictability of human affairs lies right at the heart of my argument for cultivating our powers of creativity: in business, in education and in everyday life.

The second reason for this new edition is that I now have more to say about many of the core ideas in the book and about what we should do to put them into practice. During the past ten years I have presented and debated these ideas with people at all levels in every sort of field; including CEOs of multinational corporations and not-for-profit organizations, politicians, artists, scientists, students, parents and educators. These experiences have deepened my conviction about the importance and the urgency of the arguments put forward in *Out of Our Minds*; and the need to represent them to an even wider audience.

The third reason is, not only has the world moved on in the last ten years, I have too. Literally. When I wrote the first edition, my family and I were living in Stratford on Avon, a small market town in England and birthplace of William Shakespeare. I wrote the new edition in Los Angeles, where we live now. The architect Frank Lloyd Wright once said that if you were to turn the world on its side and shake it, everything loose would land in Los Angeles. Just after the first edition of *Out of Our Minds* was published, my family and I shook loose and did just that. You can imagine what a seamless transition that turned out to be. Since then, I have traveled all over the United States meeting many extraordinary people and seeing fascinating initiatives. All of these experiences have informed this new edition, which has a much stronger emphasis on developments in the Americas and Asia as well as in Europe. The fact is that these really are global issues.

In 2006, I spoke at the world-renowned TED conference (Technology, Entertainment, Design) in Monterey, California and touched on some of the core themes of this book. That talk has since been downloaded over 5 million times in over 100 countries.¹ Mind you, our son James and daughter Kate, showed me a 30 second video on YouTube of two kittens that seem to be talking to each other and that has been downloaded 30 million times. So I am keeping this in perspective. I do know though, that unlike the cats' video, my TED talk has been shown at large and small conferences, meetings and training events, all around the world. As a result, it has been seen by an estimated 100 million people to date. That is one indication of the level of interest in these issues. I gave a second TED talk in 2010 and that too is drawing a powerful response.²

During 2008, I wrote *The Element: How Finding Your Passion Changes Everything*, published in the USA in January 2009³ and in many editions around the world since then. That book looks at the nature of personal talent and creativity and the conditions in which it flourishes. In many ways, *Out of Our Minds* is a natural companion to *The Element*. It looks in much more depth at why the need to develop our natural talents – especially creativity – is so pressing, and at how and why organizations in general and education in particular tend to stifle them in the first place. Consequently, I was delighted when Capstone suggested I work on a new edition of *Out of Our Minds* to mark the tenth anniversary of its first publication. I have to admit that initially I had in mind a less sweeping revision. I pictured spending a long weekend with a casual bottle of claret and a spell check program, sprucing up the original text. In the event I have virtually rewritten the entire book: to include new material, to make the arguments sharper and the overall tone more accessible. So if you did read the first edition, you should not be deterred from buying (or borrowing) and reading this new one. It is very different in many ways and I think you will find enough that is new

to repay a second look. If you are picking this book up for the first time, whether you work in business, education, the not-for-profit sector, or if you are concerned about your own creative potential, I trust you will find a great deal here to interest and engage you.

My aims in this book are to help individuals to understand the depth of their creative abilities and why they might have doubted them; to encourage organizations to believe in their powers of innovation and to create the conditions where they will flourish; and to promote a creative revolution in education.

I said in the original introduction that I had called the book *Out of Our Minds* for three reasons. I still have three reasons and here they are. First, human intelligence is profoundly and uniquely creative. We live in a world that's shaped by the ideas, beliefs and values of human imagination and culture. The human world is created out of our minds as much as from the natural environment. Thinking and feeling are not simply about seeing the world as it is, but having ideas about it, and interpreting experience to give it meaning. Different communities live differently according to the ideas they have and the meanings they experience. In a literal sense, we create the worlds we live in. We can also re-create them. The great revolutions in human history have often been brought about by new ideas: by new ways of seeing that have shattered old certainties. This is the essential process of cultural change.

Second, realizing our creative potential is partly a question of finding our medium, of being *in our element*. Education should help us to achieve this, but too often it does not and too many people are instead displaced from their own true talents. They are out of their element and out of their minds in that sense. Finally, there is a kind of mania driving the present direction of educational policy. In place of a reasoned debate about the strategies that are needed to face these extraordinary changes, there is a tired mantra about raising traditional academic standards. These standards were designed for other times and for other purposes – as I will explain. We will not succeed in navigating the complex environment of the future by peering relentlessly into a rear-view mirror. To stay on this course we should be out of our minds in a more literal sense.

Ken Robinson
Los Angeles, February 2011

CHAPTER 1

OUT OF OUR MINDS

“When people say to me that they are not creative, I assume that they haven’t yet learnt what is involved.”

HOW CREATIVE ARE YOU? How creative are the people you work with? How about your friends? Next time you are at a social event, ask them. You may be surprised by what they say. I have worked with people and organizations all over the world. Everywhere I go, I find the same paradox. Most children think they’re highly creative; most adults think they’re not. This is a bigger issue than it may seem.

CREATING THE FUTURE

We are living in a world that is changing faster than ever and facing challenges that are unprecedented. How the complexities of the future will play out in practice is all but unknowable. Cultural change is never linear and rarely predictable. If it were, the legions of media pundits and cultural forecasters would be redundant. It was probably with these dynamics in mind that the economist J.K. Galbraith said, “The primary purpose of economic forecasting is to make astrology look respectable.”

As the world spins faster and faster, organizations everywhere say they need people who can think creatively, communicate and work in teams: people who are flexible and quick to adapt. Too often they say they can’t find them. Why not? My aim in this book is to answer three questions for anyone with a serious interest in creativity and innovation, or in simply understanding their own creative potential.

- **Why is it essential to promote creativity?** Business leaders, politicians and educators emphasize the vital importance of promoting creativity and innovation. Why does this matter so much?
- **What is the problem?** Why do people need help to be creative? Young children are buzzing with ideas. What happens as we grow up to make us think we are not creative?
- **What is involved?** What is creativity? Is everyone creative or just a select few? Can creativity be developed and, if so, how?

Everyone occasionally has new ideas, but how can creativity be encouraged as a regular and reliable part of everyday life? If you are running a company or an organization or a school, how do you make creativity systematic and routine? How do you lead a culture of innovation?

RETHINKING CREATIVITY

To answer these questions it is important to be clear about what creativity is and how it works in practice. There are three related ideas, which I will elaborate as we go on. They are *imagination*, which is the process of bringing to mind things that are not present to our senses; *creativity*, which is the process of developing original ideas that have value, and *innovation*, which is the process of putting new ideas into practice. There are various misconceptions about creativity in particular.

“My starting point is that everyone has huge creative capacities as a natural result of being a human being. The challenge is to develop them. A culture of creativity has to involve everybody, not just a select few.”

Special people?

It is often thought that only special people are creative: that creativity is a rare talent. This idea is reinforced by histories of creative icons like Martha Graham (1894–1991), Pablo Picasso (1881–1973), Albert Einstein (1879–1955) and Thomas Edison (1847–1931). Companies often divide the workforce into two groups: the ‘creatives’ and the ‘suits’. You can normally tell who the creatives are because they don’t wear suits. They wear jeans and they come in late because they have been struggling with an idea. I don’t mean to suggest that the creatives are not creative. They can be highly creative, but so can anybody if the conditions are right, including the suits. Everyone has huge creative capacities. The challenge is to develop them. A culture of creativity has to involve everybody, not just a select few.

Special activities?

It is often thought that creativity is about special activities, like the arts, or advertising, or design, or marketing. All of these can be creative; but so can anything, including science, mathematics, teaching, working with people, medicine, running a sports team or a restaurant. Schools sometimes have ‘creative arts’ departments. I am an uncompromising advocate of better provision for the arts in schools. I will explain why later. But creativity is not confined to the arts. There are many reasons for teaching the arts in schools, including their role in fostering creativity; and there are others that are just as compelling. At the same time, other disciplines, including science and mathematics can be just as creative as music and dance. Creativity is possible whenever we’re using our intelligence.

In business too, different companies are creative in different areas. Apple, for example, is famously good at creating new products. Others, like Wal-Mart, haven’t created any products at all; their area of innovation is in systems, such as supply chain management and pricing. The coffee chain, Starbucks, is creative in providing services. Starbucks didn’t invent coffee; it created a particular type of culture around coffee. Actually, it did invent the \$5 cup of coffee, which was a bit of a breakthrough, I thought. An innovation in any part of an organization can transform its fortunes.

My starting point is that everyone has huge creative capacities as a natural result of being a human being. The challenge is to develop them. A culture of creativity has to involve everybody not just a select few.

Learning to be creative

It’s often thought that creative people are either born creative or not, just as they may have blue or brown eyes, and there is not much they can do about it. The fact is, there is a lot you can do to help people become more creative. If someone tells you they cannot read or write, you don’t assume that they are not capable of reading and writing, but that they haven’t been taught how. It is the same with creativity. When people say to me that they are not creative, I assume they just haven’t yet learnt what is involved.

Letting go?

Creativity is sometimes associated with free expression, which is partly why some people worry about creativity in education. Critics think of children running wild and knocking down the furniture rather than getting on with serious work. Being creative does usually involve playing with ideas and having fun; enjoyment and imagination. But creativity is also about working in a highly focused way on ideas and projects, crafting them into their best forms and making critical judgments along the way about which work best and why. In every discipline, creativity also draws on skill, knowledge and control. It’s not only about letting go, it’s about holding on.

Why are these issues important anyway?

THREE THEMES

Running throughout this book there are three fundamental themes:

- The first is that we are living in times of revolution.
- The second is that if we are to survive and flourish we have to think differently about our own abilities and make the best use of them.
- The third is that in order to do so we have to run our organizations and especially our education systems in radically different ways.

I go into each of these issues in more detail in the chapters ahead, but let me quickly summarize my argument.

Facing the revolution

No matter where you are or what you do, if you are alive and on earth you are caught up in a global revolution. I mean this literally not metaphorically. There are forces at work now for which there are no precedents. I know this is a bold claim but it is justified. Human affairs have always been turbulent. What is distinctive now is the rate and scale of change. The two great driving forces are technological innovation and population growth. Together they are transforming how we live and work; they are putting a vast strain on the Earth's natural resources and changing the nature of politics and culture.

New technologies are revolutionizing the nature of work everywhere. In the old industrial economies they are massively reducing the numbers of people in industries and professions that were once labor-intensive. New forms of work rely increasingly on high levels of specialist knowledge, and on creativity and innovation. The new technologies in particular require wholly different capacities from those required by the industrial economy. Manufacturing is shifting to the emergent economies, especially in Asia and South America, and so too are many of the new forms of work that depend on high levels of skill in design and information technologies. Given the speed of change, governments and businesses throughout the world recognize that education and training are the keys to the future, and they emphasize the vital need to develop powers of creativity and innovation. First, it is essential to generate ideas for new products and services, and to maintain a competitive edge. Second, it is essential that education and training enable people to be flexible and adaptable, so that businesses can respond to changing markets. Third, everyone will need to adjust to a world where, for most people, secure lifelong employment in a single job is a thing of the past.

These technological changes, combined with population and climate changes, are affecting everyone on earth and the outcomes are essentially unpredictable. What is certain is that in the next 50 to 100 years, our children will need to confront challenges that are unique in human history. In the first section of the book, I outline what these forces are and some of the challenges they present.¹

Reframing our potential

In December 1862, Abraham Lincoln gave his second annual address to Congress. He was writing one month before he signed the Emancipation Proclamation, and in his message he urged the Congress to see the situation they faced with fresh eyes. He said this: "The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty. As our case is new, so we must think anew and act anew. We must disenthral ourselves and then we shall save our country."²

I love the word: 'disenthral'. What he meant was that we all live our lives guided by ideas to which we are devoted but which may no longer be true or relevant. We are hypnotized or enthralled by them. To move forward we have to shake free of them.

Given the challenges we face now, the most profound shift has to be in how we think about our own abilities, and those of our children. In my experience, many, perhaps most people have no idea of their real capabilities and talents. Too many think they have no special talents at all. My premise is that we are all born with immense natural talents but that too few people discover what they are and even fewer develop them properly. Ironically one of the main reasons for this massive waste of talent is the very process that is meant to develop it: education.

Education is not always a good word to use socially. If I am at a party and I tell someone I work in education I can sometimes see the blood drain from their face. "Why me?" they're thinking, "Trapped with an educator on my one night out all week." But, if I ask them about their education, or about their children's schooling, they pin me to the

wall. They want to talk about their own experiences. Everyone has very strong opinions. Education is one of those topics that runs very deep with people – like religion, politics and money. And so it should. Education is vital to the success of our working lives, to our children’s futures and to long-term global development. More than this, it stamps us with an impression of ourselves that is hard to remove.

Some of the most successful people in the world did not do well at school. No matter how successful they have become, they often carry a secret worry that they are not as clever as they are making out. They include teachers, university professors, vice-chancellors, business people, musicians, writers, artists, architects and many others. Many succeeded only *after* they had recovered from their education. Of course, many people loved their time in education and have done well by it. What of those who didn’t?

Current approaches to education and training are hobbled by assumptions about intelligence and creativity that have squandered the talents and stifled the creative confidence of untold numbers of people. This waste stems partly from an obsession with certain types of academic ability and from a preoccupation with standardized testing. The waste of talent is not deliberate. Most educators have a deep commitment to helping students do their best. Politicians too, make impassioned speeches about making the most of every student’s abilities. The waste of talent may not be deliberate but it is systemic. It is systemic, because public education is a system, and it is based on deep-seated assumptions that are no longer true.

Before the middle of the nineteenth century, relatively few people had any kind of formal education. Being educated was mainly the privilege of the few who could afford it. Mass systems of public education were developed primarily to meet the needs of the Industrial Revolution and, in many ways, they mirror the principles of industrial production. They emphasize linearity, conformity and standardization. One of the reasons they are not working now is that real life is organic, adaptable and diverse.

Some weeks before our son started at university in Los Angeles, we went along for an orientation day. At one point, the students were taken away for a separate briefing on program options and the parents were taken to the finance department for a form of grief counseling. We then had a presentation from one of the professors about our roles as parents during our children’s student days. Essentially he advised us to step out of their way and spare them too much of our career advice. He gave the example of his own son who had been a student at the University some years before. He had originally wanted to study the classics. The professor and his wife were not thrilled at the job prospects that a classics degree would open up for him. So they were relieved when at the end of the freshman year he said he had decided to take a major in something that would be more useful. They asked their son what he had in mind and he said philosophy. His father pointed out that none of the big philosophy firms were hiring at the time. His son took some philosophy courses anyway and then eventually majored in art history.

After college he found a job in an international auction house. He traveled, made a good living and loved the work and the life. He got the job because of his knowledge of ancient cultures, his intellectual training in philosophy and his love of art history. Neither he nor his parents could have predicted that path when he started his college studies. The principle is the same for everyone. Life is not linear. When you follow your own true north you create new opportunities, meet different people, have different experiences and create a different life.

The hierarchy of disciplines in schools is based partly on assumptions about supply and demand in the market place. The new economies demand a deeper conception of talent and the organic nature of our lives demands it too. What we become in future is deeply influenced by our experiences here and now. Education is not a linear process of preparation for the future: it is about cultivating the talents and sensibilities through which we can live our best lives in the present and create the best futures for us all.

Acting differently

Given the changes that are now engulfing us, most countries have recognized the need to reform their education systems. This is good but it is not good enough. The challenge now is to transform them. In the second section of the book, I look at the roots of current approaches to education and why they have marginalized the talents of so many people. I suggest a different way of thinking about the real potential of imagination and creativity in our lives. But as Lincoln said, it’s not enough to think differently. We also have to act differently.

The recession of 2008 wiped out the credit and asset bubbles that had been fueling over-consumption and over-production around the world. As the recession blew like a hurricane through the old industrialized economies it left a trail of failed businesses, oceans of debt and deep pools of structural unemployment.

Among the worst affected are young people. As I write this, global levels of unemployment among young people, aged from 15 to 24, are the highest on record.³ In August 2010, the International Labor Organization (ILO) published its report on *Global Employment Trends for Youth 2010*. The report concludes that there are approximately 620 million economically active young people worldwide. At the end of 2009, 81 million of them were unemployed; the highest number ever, and almost 8 million more than in 2007. The youth unemployment rate increased from 11.9 percent in 2007 to 13.0 percent in 2009. The ILO argues that these trends will have “significant consequences for young people as upcoming cohorts of new entrants join the ranks of the already unemployed” and warns of the “risk of a crisis legacy of a ‘lost generation’ comprised of young people who have dropped out of the labor market, having lost all hope of being able to work for a decent living.”

For millions of young people, the future seems bleak and despairing. They have no work and see no prospect of it. Youth unemployment rates have been more sensitive to the economic crisis than adult rates of unemployment and, historically, the recovery of the job market for young men and women tends to lag behind that of adults. For people of all ages, the economic recovery, when it comes, will not be easy; and even when it does arrive, it will not be business as usual. As Thomas Friedman, author of the *World is Flat*, puts it, “Those who are waiting for this recession to end so someone can again hand them work could have a long wait.” Rebuilding the communities that have been left bereft by the recession will depend on imagination, creativity and innovation. As the ILO report argues, creating jobs for the millions of young women and men entering the labor market every year is a critical component in the path towards wealthier economies. It is not only the quantity but also the quality of jobs that matters.

Friedman continues, “Those who have the ability to imagine new services and new opportunities and new ways to recruit work … are the new Untouchables. Those with the imagination to invent smarter ways to do old jobs, energy-saving ways to provide new services, new ways to attract old customers or new ways to combine existing technologies will thrive.” The solution is better education and training. Here too, the future cannot be business as usual. “We not only need a higher percentage of our kids graduating from high school and college – more education – but we need more of them with the right education. Our schools have a doubly hard task, not just improving reading, writing and arithmetic but entrepreneurship, innovation and creativity. We’re not going back to the good old days without fixing our schools as well as our banks.”⁴

All organizations are competing in a world in which the ability to innovate and adapt to change is not a luxury: it is a necessity. In 2010, IBM published *Capitalizing on Complexity*; the fourth edition of its biennial global CEO study series led by the IBM Institute for Business Value.⁵ Introducing the report, Samuel J. Palmisano, Chairman, President and Chief Executive Officer of IBM said, “We occupy a world that is connected on multiple dimensions and at a deeper level – a global system of systems.” It is this unprecedented level of interconnection and interdependency that underpins the most important findings in the IBM report.

The study found that at the top of the agendas of global business and public sector leaders, there are three widely shared perspectives. First, they believe that a rapid escalation of complexity is the biggest challenge confronting them. They expect it to continue – indeed to accelerate – in the coming years. Second, they are equally clear that their enterprises today are not equipped to cope effectively with this complexity in the global environment.

Third, they agree overwhelmingly that the single most important leadership competency for organizations to deal with this growing complexity is creativity.

The consequences of a lack of creativity can be severe. Organizations that stand still are likely to be swept aside, and corporate history is littered with the wreckage of companies, and whole industries, that have been resistant to change. They became stuck in old habits and missed the wave of change that carried more innovative companies forward. I once spoke at a gala dinner in London to launch a list of the Fortune Global 500 Companies. The top three companies were American. Ten years earlier, the top three companies had all been Japanese. Now an increasing number of Chinese companies are climbing the ranks. No organization has an assured place at the top of any list. Fortunes rise or fall according to how well they adapt to changing circumstances. One way of describing the decline of the Japanese companies is that they were victims of climate change. The world around them changed faster than they did and they suffered the consequences. The economies of China, South America and India, on the other hand, are adapting fast to the new demand for technological innovation.

Few people would dispute that in the eighteenth and nineteenth centuries, Europe and especially Great Britain dominated the world culturally, politically and economically. Britain was the crucible of the Industrial Revolution and its military forces secured the colonies as surely as the English language invaded their cultures. When Queen Victoria ascended to the throne in 1837, she presided over the largest empire in history: the empire on which the sun never set.

If you had gone to her court in 1850 and suggested that this empire would be over within a generation, you would have been laughed out of the building. And yet it was true. By the end of World War I in 1918, the empire was fatally wounded and, by the time I was born in 1950, it was a memory. Culturally, politically and economically, the 20th century was dominated by the United States, as surely as Europe had dominated the nineteenth century. Whether it will dominate the 21st century remains to be seen. As award-winning US scientist Jared Diamond has shown, empires tend to collapse rather than fade away.⁶ Think of the Soviet Union and its rapid dissolution in the 1980s and 1990s.

All organizations are organic and perishable. They are created by people and they need to be constantly re-created if they are to survive. When organizations fail, the jobs and communities that depend on them falter too. In a world where lifelong employment in the same job is a thing of the past, creativity is not a luxury. It is essential for personal security and fulfillment.

Leading a culture of innovation has radical implications for how institutions are organized – whether they are schools or corporations – and for styles of leadership. Many organizations put on occasional training days to encourage their staff to think creatively; but like the ritual of rain dancing, they often underestimate the problems they are trying to solve. For these reasons, this is not a conventional book on creativity, offering tips for next week's course. It is about the root causes of the problem rather than the symptoms of it. In the final part of the book, I summarize what's involved in tackling these deeper problems.

"The challenge now is to transform education systems into something better suited to the real needs of the 21st century. At the heart of this transformation there has to be a radically different view of human intelligence and of creativity."

CONNECTING EDUCATION, BUSINESS AND CULTURE

During my own career, I have worked with national education systems, with school districts, with principals, teachers and students from kindergarten to university and beyond, including community colleges and adult education associations. I have directed national research projects, taught in universities and trained teachers. I also work now with every type of business, including Fortune 500 companies, with major banks and insurance houses, design companies, media corporations, information technology organizations, and with retail, manufacturing, engineering and service companies. And I work with major cultural centers in the arts and the sciences; with museums, orchestras, and with dance and theatre companies and community arts organizations. My work has taken me to Europe, North America, South America, the Middle East and Asia.

In my experience, education, business and the cultural sector face many common challenges. Some are compounded by the fact that they have so little contact with each other. This book addresses all three of these fields because I believe that the future lies in closer coordination between them. The problems that business organizations face are immediate. There are some immediate things they can do to tackle them and I say what they are. But the long-term solution lies upstream in the education system.

All over the world, governments are pouring vast resources into education reform. In the process, policy makers typically narrow the curriculum to emphasize a small group of subjects, tie schools up in a culture of standardized testing and limit the discretion of educators to make professional judgments about how and what to teach. These reforms are typically stifling the very skills and qualities that are essential to meet the challenges we face: creativity, cultural understanding, communication, collaboration and problem solving. This is not a party-political issue. Politicians of all persuasions are curiously united in this respect. They argue over the funding and organization of education, over access and selection and about the best ways to improve standards. But it is rare to hear politicians of any party raise questions about the absolute importance of academic standards or of standardized systems of education.

Ironically, they promote these policies in the interests of the economy.⁷ I say ironically because when I talk with business leaders, they complain that education isn't producing the thoughtful, creative, self-confident people they urgently need: people who are literate, numerate, who can analyze information and ideas; who can generate new ideas of their own and help to implement them; who can communicate clearly and work well with other people. They want education to provide such people, but too often they also cling to an uncritical belief in traditional academic education.

Many educators want to provide a more balanced and dynamic form of education that makes proper use of their own creative energies. Too often they feel they cannot do any of this because of political pressures of conformity and the disaffection of students who suffer under the same malaise. Meanwhile, parents lie awake at night worrying about the quality of their children's education. Most parents assume that education will help their children to find work and become economically independent. I know I do. I cannot tell you how much I want my children to be economically independent and as soon as possible. Parents also want education to help young people to identify their unique talents and to lead a life that has meaning and purpose. This is also what young people want for themselves. As we grow up, education is meant to guide us from childhood to maturity. It should be high among the ways in which we realize our creative abilities. More often it is why we lose sight of them.

These issues, covered in *Out of Our Minds*, affect all of us, deeply. The book touches on economic globalization and the revolutionary challenges facing business and work. It looks at some of the extraordinary developments in science and technology that will make the changes we have seen so far seem primitive by comparison. It looks at how we run companies and organizations and the changes that are needed in order to cultivate a spirit of creativity and innovation. And it looks at ideas about intelligence and creativity upon which our current systems of education are based and considers why and how they too have to change, and soon. This range of coverage is important if we're to alter the conversation about creativity and deal not just with the symptoms but with the causes of the problems we now face.

BEYOND IMAGINING

In most respects, we human beings are like most other organisms on earth. Our lives are brief in cosmic terms; we pass through a common cycle of mortality from conception to birth to death; we have many of the same physical needs as other species and we depend on nutrients that the earth supplies. Over the past few centuries of industrialism, more and more people have moved off the land into cities and seem to believe that we can live apart from the rest of nature. The growing climate crisis is a reminder that we cannot. But in one respect at least, human beings are radically different from the rest of life on earth. We have imaginations. As a result we have unlimited powers of creativity.

By imagination I mean the power to see beyond the present moment and our immediate environment. In imagination we can bring to mind things that are not present to our senses. We can visit the past, and not just a single view of the past. We can review and reinterpret the past. We can enhance our sense of the present by seeing with other people's eyes. And we can anticipate many possible futures. We may not be able to predict the future but we can help to shape it.

"We may not be able to predict the future but we can help to shape it."

Biologically, we are probably evolving at the same rate as other species: in cultural terms, we have always evolved at a uniquely furious rate. So far as we can tell, the cultural lives of dogs and cats are not changing that much. Left to their own devices, they seem to be doing what they have always done and to be pre-occupied with the same sorts of things. There is no need to keep checking in with them to see what's new. In human life, there is always something new, because creativity is part of what it is to be human.

It may be that some of the challenges that we have generated, in the natural environment, in politics and in our conflicting beliefs, will overcome us, and maybe sooner rather than later. If so, it will not be because we have made too much use of our imaginations but too little. Now, more than ever, we need to exercise the unique creative powers that make us human in the first place.

CHAPTER 2

FACING THE REVOLUTION

“By about 2040, there will be a backup of our brains in a computer somewhere, so that when you die it won’t be a major career problem.”

Ian Pearson[1](#)

THE PACE OF CHANGE is quickening every day. New technologies are transforming how we think, work, play and relate to each other. At the same time, the population of the earth is larger and growing faster than at any time in history. Many of the challenges that we face are being generated by the powerful interaction of these forces. The problem is that many of our established ways of doing things, in business, in government and education, are rooted in old ways of thinking. They are facing backwards, not forwards. As a result, many people and organizations are having a hard time coping with these changes and feel left behind or alienated by them. To face these challenges we have to understand their nature; to meet them, we have to recognize that cultivating our natural powers of imagination, creativity and innovation is not an option but an urgent necessity. These challenges are global: they affect everyone. They are also personal: they affect all of us as individuals. As this is my book, let’s start with me.

GETTING OUT MORE

I was born in Liverpool, England in 1950. Back then, people didn’t really go anywhere. A visit to the nearest town was a day’s outing. In some regions, dialects were so distinct that it was possible to tell which *village* or part of town someone came from. My father was born in 1914. He lived his whole life in Liverpool and rarely traveled more than 30 miles from the city. My mother was born in 1919 and it was only later in her life that she traveled out of the country for holidays. I have five brothers and a sister. My brother John has been piecing together our family tree. He has found out that in the mid-to-late 19th century, seven of our eight great grandparents grew up within a couple of miles of each other, in Liverpool; in some cases in adjacent streets. That’s how they met. On the whole, people then did marry locally and expected, in the main, to live the sorts of lives their parents had led. They weren’t besieged with media images of celebrities and reality stars that made them hesitate about settling for the person they had just met at the shops. They lived local lives and most people always did.

In contrast, I now travel so much for my work that I sometimes cannot remember where I’ve been or when. I went recently to Oslo, Norway to speak at a conference. I flew overnight from Los Angeles, via New York. The plane was delayed and I arrived in Oslo five hours late, tired but looking forward to the event. As I was getting ready to go on stage, one of the organizers asked me whether I’d been in Oslo before. I told her confidently that I hadn’t but that the city seemed fascinating. A few hours later, I remembered that I *had* been in Oslo before. For a week! Admittedly it was about fifteen years earlier, but even so. You don’t usually just wander into Norway without noticing. In a week, you do all kinds of things: eat, shower, meet people and talk and think about Norwegian things. I’d been to the National Art Gallery and spent time looking at paintings by Edward Munch, including *The Scream*, which is what I felt like doing when I realized I’d forgotten the entire trip. It may be a sign that I am on the move too much. I think it’s also a sign of the times.

I used to live in England in a village called Snitterfield (really), which is three miles from Stratford-upon-Avon; the home of William Shakespeare. Snitterfield is also where William Shakespeare’s father, John, was born in 1531. When he was 20 years old he decided to leave Snitterfield to seek his fortune in Stratford – three miles away. It is impossible to grasp the differences between his view of the world and ours almost 500 years later, when business travelers routinely fly across continents to attend meetings for the weekend and then forget where they’ve been. For

most of human history, social change was snail-like in comparison with now. Although there were revolutionary developments in the form of the discovery of new continents, spice routes, and inventions during his lifetime, John Shakespeare's daily life probably differed very little from that of his parents, grandparents or great grandparents.

"To understand how hard it is to anticipate the future now, we need only think of how difficult it proved to predict the future in the past."

My father never left England. For work or pleasure, I've now been to most countries in Europe, the Far East and many parts of the United States and of Australia. By their early teens my children had visited more countries than I had by the age of 40. When I was growing up in the 1950s and 60s, I thought of my parent's childhood in the 1920s as the Middle Ages: horses in the street, few cars, steam trains, grand ocean liners, no air travel to speak of, no television, and few telephones. When we got our first black and white television in 1959, my family felt we'd reached the last stage of human evolution. My own children now have a similarly quaint view of my childhood: only two television channels, no color or surround sound, no TiVo, no computer games, cell phones, iPods, fast food, Twitter or Facebook. Their world is inconceivably different and an epoch away from those of my grandparents and great grandparents.

The differences are not only in the nature of change but also in the pace of it. The most profound changes haven't happened in 500 years: most have them have happened in the past 200 years and especially in the last 50 and they're getting faster. According to one estimate:

- in 1950 the average person travelled about 5 miles per day;
- in 2000 the average person travelled about 30 miles per day; and
- in 2020 the average person will travel about 60 miles per day.

Imagine the past 3000 years as the face of a clock with each of the 60 minutes representing a period of 50 years. Until three minutes ago, the history of transport was dominated by the horse, the wheel and the sail. In the late 18th century, James Watt refined the steam engine. This changed everything. It was a major tremor in the social earthquake of the Industrial Revolution. The improved steam engine vastly increased the power available for industrial production. It paved the way for faster methods of transport by road and sea and made possible the development of railways, the arterial system of the early industrial world. The steam engine impelled vast movements of humanity at speeds that were never thought possible. Since then, the curve of change has climbed almost vertically:

- 4 minutes ago internal combustion engine (François Isaac de Rivaz, 1807)
- 2.5 minutes ago motor car (Karl Benz, 1885)
- 2 minutes ago first powered airplane flight (Wright brothers, 1903)
- 1.9 minutes ago rocket propulsion (Robert Goddard, 1915)
- 1.5 minutes ago jet engine (Hans von Ohain, and Frank Whittle, 1930)
- 1 minute ago first man-made object orbits the earth (Sputnik 1, 1957)
- 50 seconds ago first manned moon landing and moon walk (Apollo 11, 1969)
- 30 seconds ago reusable space shuttle (Discovery, 1981)
- 2 seconds ago roadable aircraft (Terrafugia Transition, 2009)
- 1 second ago unmanned spaceplane (X-37B, 2010)

The revolution in transport is one index of the pace of change, but it's not the fastest one.

GETTING THE MESSAGE

Human beings have had access to writing systems for at least 3000 years. For most of that time these systems hardly changed. People communicated by making marks on surfaces, using pens on paper, chisels on stone or pigment on boards. Written documents existed in single copies and had to be copied by hand. Only a privileged few had access to them and only those few needed to be able to read. Between 1440 and 1450, about eleven minutes ago on our clock, Johannes Gutenberg invented the printing press. Since then the process of change has gathered at a furious pace. Think of the major innovations in communication in the past 200 years, and how the gaps on the clock have

shortened:

- 11 minutes ago printing press (1440–1450)
- 3.4 minutes ago Morse Code (1838–44)
- 2.7 minutes ago telephone (1875)
- 2.5 minutes ago radio (1885)
- 1.6 minutes ago black and white television (1929)
- 54 seconds ago fax (1966)
- 41 seconds ago personal computer (1977)
- 38 seconds ago analog cell phone (1979)
- 25 seconds ago World Wide Web (1990)
- 22 seconds ago SMS messaging (1993)
- 13 seconds ago broadband (2000)
- 1 second ago 3-D TV (2010)

When I was born in 1950, no one had a home computer. The average computer then was about the size of your living room. This was one reason people didn't buy them: they weren't inclined to live outdoors to accommodate a largely useless device. A second reason was the cost. Computers cost hundreds of thousands of dollars. Only government departments and some companies had computers. In 1950 the transistor was invented. In 1970, the silicon chip was developed. These innovations not only reduced the size of computers, they vastly increased their speed and power. The standard memory capacity has increased exponentially since then, from a few hundred kilobytes to several gigabytes.

If you have an iPhone, it probably has more computing power than was available on earth in 1940. Many children's toys have more computing power than 1960s mainframes. In 1960, Jerome Bruner and George Miller founded the Harvard Center for Cognitive Studies; the first institute dedicated to cognitive science. The Institute was well funded and purchased the first computer used in America for psychological experimentation: a PDP4 minicomputer. It cost \$65,000 in 1962 and came with 2K of memory, upgradable to 64K.² The average digital wristwatch has appreciably more power and memory than the 1969 Apollo Moonlander: the space vehicle from which Neil Armstrong took his small step for man and his giant leap for mankind.

It is now estimated that something in the order of 10^{17} microchips are being manufactured every year; a number, I'm told, that's roughly equivalent to the world population of ants. I repeat it here in the confident knowledge that it can't be checked or contradicted. This extraordinary rate of production mirrors the vast range of applications for which computers are now used. The pace of expansion in computer technology over the past 70 years has been breathtaking. Here's a rough chronology:

- 1937–42 First electronic digital computer, created at Iowa State University.
- 1951 First commercially produced computer, The Ferranti Mark 1 sells nine between 1951 and 1957.
- 1965 First phone link set up between two computers.
- 1972 First email program created.
- 1974 The term 'Internet' first used.
- 1975 The Altair personal computer spawns home-computing culture.
- 1976 Steve Wozniak builds the Apple I with Steve Jobs.
- 1981 IBM enters the home-computing market and sells 136,000 in first 18 months.
- 1983 Microsoft Word launched.
- 1984 1000 Internet hosts.
- 1989 100,000 Internet hosts.
- 1990 Microchips are invented in Japan that can store 520,000 characters on a sliver of silicon 15 mm by 5 mm.
- 1992 Internet hosts exceed 1 million.
- 1997 Internet hosts rise from 16 million to 20 million by July.

www.google.com registered as a domain name.

- 2002 The first social networking site Friendster launches in USA.
- 2003 Skype VOIP telephony is launched in Sweden based on software designed by Estonian developers.
- 2004 The term Web 2.0 is devised to describe an increase in user-generated web content.

- 2006 Twitter is launched.
- 2007 Google surpasses Microsoft as the most valuable and most visited online brand.
- 2010 Global number of Internet users nearly 2 billion. (World population approaching 7 billion.) Asia makes up 40 percent of users. The Middle East, Africa and South America are the fastest growing sectors.

The Internet is the most powerful and pervasive communication system ever devised. It grows daily, like a vast, multiplying organism; millions of connections are being added at an ever-faster rate in patterns that resemble dendritic groupings or ganglia in the brain. Just like the brain, the synapses that fire most often have the most robust response. Inventor and futurist Ray Kurzweil points out that the evolution of biological life and of technology have followed the same pattern. They both take a long time to get going but advances build on one another and progress erupts at an increasingly furious pace: “During the 19th century, the pace of technological progress was equal to that of the ten centuries that came before it. Advancement in the first two decades of the 20th century matched that of the entire nineteenth century. Today significant technological transformations take just a few years; ... Computing technology is experiencing the same exponential growth.”

Gordon Moore was a co-founder of Intel in the mid-1960s. He estimated that the density of transistors on integrated circuit boards was doubling every twelve months and that computers were periodically doubling both in capacity and in speed per unit cost. In the mid-1970s Moore revised his estimate to about 24 months. It’s anticipated that Moore’s Law will have run its course around 2020. By then transistors may be just a few atoms in width. The power of computers will continue to grow exponentially, but in different forms. If the technology of motorcars had developed at the same rate, the average family car would be very different by now. It could travel at six times the speed of sound, be capable of about 1000 miles per gallon and would cost you about one dollar to buy. I imagine you’d get one. You’d just have to be careful with the accelerator.

The rate of technological innovation in the past 50 years has been breathtaking. But the indications are that the revolution may only just be getting underway. In the next 50 years we may see changes that are as unimaginable to us now as the iPad would have been to John Shakespeare. One of the portals into this radical future is nanotechnology.

IT’S ONLY JUST BEGUN

Nanotechnology is the manipulation of very small things indeed. Nanotechnologists are building machines by assembling individual atoms. To measure the vast distances of space, scientists use the light year – the number of miles that light travels in a year, which is equivalent to just under 10 trillion kilometers, or 6 trillion miles. I asked a professor of nanotechnology what they use to measure the unthinkably small distances of nanospace. He said it was the nanometer, which is a billionth of a meter. A *billionth* of a meter. It’s almost impossible to grasp how small this distance is. Mathematically it is 10^{-9} meter or 0.000000001 meter. Does that help? I understood the idea but couldn’t visualize it. I asked, “What is that roughly?” He thought for a moment and said, “A nanometer is roughly the distance that a man’s beard grows in one second.” I’d never thought about what beards do in a second but they must do something. It takes them all day to grow about a millimeter and they don’t do it suddenly. They don’t leap out of your face at eight o’clock in the morning. Beards are languid things and our language reflects this. We do not say “as quick as a beard” or “as fast as a bristle.” We now have a way of grasping how slow they are: about a nanometer a second.

A nanometer is very small indeed, but it’s not the smallest thing around. If you have a nanometer, you can have half of one. There is indeed a picometer, which is a thousandth of a nanometer. Then there is an attometer, which is a millionth of a nanometer. And there is a femtometer, which is a billionth of a nanometer: a *billionth* of a *billionth* of a meter. So if your beard had a beard ...

In 1995, Professor Sir Harry Kroto won the Nobel Prize for Chemistry. With others, he discovered the third form of carbon, a nanotube of graphite called the C60 molecule, also known as the Buckminster Fullerene or Bucky Ball after the American architect Buckminster Fuller. Fuller made extensive use of geodesic shapes that are similar to the structures of the C60 molecule. The C60 has remarkable qualities. It is a hundred times stronger than steel, a tenth of the weight and it conducts electricity like a metal. This discovery triggered a wave of research in engineering, aerospace, medicine and much else. If it can be produced in industrial quantities, the C60 would make possible the construction of airplanes 20 or 50 times their present size but much lighter and more fuel-efficient. Buildings could be erected that go through the atmosphere: bridges could span the Grand Canyon. Motorcars and trains could be a

fraction of their current weight with greater fuel economies through the use of solar power.

Theoretically, nanotechnology makes it possible to create any substance or object from the atomic level upwards. While scientists speculate about the practical possibilities, others wonder about the political and economic consequences. As Charles Ostman, Senior Fellow at the Institute for Global Futures, notes, “Right now power and influence in the world is based on the control of natural and industrial resources. Once nanotechnology makes it possible to synthesize any physical object cheaply and easily, our current economic systems will become obsolete. It would be difficult to envision a more encompassing realm of future development than nanotechnology.”³

Whether or not these possibilities actually materialize, nanotechnology promises radical innovations in fields as disparate as engineering and medicine. Its applications range from “molecular computing, to shape-changing alloys, to synthetic organic compounds, to custom gene construction, to ultra-miniaturized machinery.” In medicine, nanomachines with rotor blades on the scale of human hair are being proposed as scrubbers to swim through veins and arteries cleaning out cholesterol and plaque deposits. In Ostman’s view, in other medical applications, “the implications for modifying the cellular chemistry of almost any organ of the human body to cure disease, prolong life, or to provide enhanced sensory and mental abilities, are almost beyond comprehension.” Artificially growing skin cultures are already being produced, and research in the development of an organic artificial heart is taking place in several different locations.

Nanotechnology is also leading to the extreme miniaturization of computer systems and will further revolutionize how we use them. In the near future, computers will be small and flexible enough to be worn on the body and be powered by the surface electricity of your skin. The problem then will be what to do with the monitor: you won’t want a thin film of microprocessors clinging to your wrist and a large monitor strapped on your chest. One solution is retinal projectors that use low-level lasers mounted on spectacle frames and project the display directly into the eyes. A version of this technology is already in use in advanced aircraft systems. Pilots see the navigation displays on the inside of their visors and can change the direction of the aircraft by moving their eyes. You hope they don’t sneeze in hostile airspace.

For more everyday use, computers could be woven into clothing. Shirts could have sensors that monitor heartbeat and other vital signs. Hints of serious ill health could be relayed directly to a doctor. Smart shoes could turn the action of walking into enough energy to power wearable computers.⁴ Other innovations will soon replace the conventional keyboard. Already, interfaces are available that are controlled purely by the power of thought. Headsets have been designed to monitor brainwaves, which can then be converted directly into instructions. But this is only the beginning. All these devices work outside their users’ bodies. Soon, information technologies may move inside our bodies and even into our brains. Computers may be about to merge with our own minds and consciousness.

USING YOUR BRAIN

For generations, scientists developed their understanding of the brain by dissecting dead brains on laboratory tables. This approach had some obvious limitations. Fortunately, in the last 20 years, the technologies of brain scanning have made it possible to study living brains. Neuroscientists now understand much more about the gross functions of the brain: which parts are used in different activities and in which combinations; in speech for example, in recognizing faces, listening to music, or doing mathematics. Neuroscience is using nanotechnology to explore the processes of thought and perception at the molecular level including the transfer of electrical charges at the neural synapses. These studies are generating wholly new approaches in psychology, in the design of drugs and in the treatment of pain.

Some of the most extraordinary implications of these different fields of research in information systems, material sciences and in neuroscience lie in the crossovers between them. It is now possible to conceive of information technologies modeled on the neural processes of the brain. A new generation of computers may be based not on digital codes and silicon but on organic processes: computers that mimic human thought.

I was talking recently with a senior technologist at one of the world’s leading computer companies. At the moment, he said, the most powerful computers on earth have the processing power of the brain of a cricket. I don’t know if this is true and nor does he. I don’t know any crickets and if I did I’d have no way of telling what, if anything, is going on in their brains. His point is that even the most powerful supercomputers are still just mindless calculators. They perform tasks that humans cannot but they don’t have any opinions about what they do. They don’t think, in any proper sense of the term. Similarly, airplanes are much better than we are at flying at 35,000 feet but there’s no point asking them how they feel about it. They don’t. This is all changing.

point asking them how they feel about it. They don't. This is all changing.

SUPERCHARGING YOUR BRAIN

In the foreseeable future, the most powerful computers may have the processing power of the brain of a six-month-old human baby. At that point we will cross a threshold: computers will be capable of learning. I asked what that means. I was told that they would be able to rewrite their own operating systems, based on their experiences: "their experiences." In some sense, computers may soon become conscious. By 2020, it may be possible for \$1000 to buy a personal computer with the same processing power as an adult human brain.⁵ How's that going to feel when you're working with a computer that's as smart as you are: maybe not as attractive as you are, or as much in demand socially, but as smart as you? You give this machine an instruction and it hesitates, and says, "Have you thought this through? I'm not sure that you have." By 2030, personal computers, whatever form they take by then, could have the processing power of not one but of a thousand human brains.

Perhaps most significantly, the interaction of genetics, neuroscience and information systems makes it feasible to think about enhancing our own intelligence by physically merging computers with our brains. Computers, in the form of neural implants, are already being placed into people's brains to counteract Parkinson's disease and tremors from multiple sclerosis. Cochlear implants are available to restore hearing. There have been experiments in which a completely blind patient's optic nerve fibers were connected to a computer-driven dot matrix display and the patient was able to see crude patterns. Retinal implants are being developed to provide at least some visual perception in blind individuals by replacing certain visual processing circuits of the brain.

By 2020, neural implants could improve our general sensory experiences, including our powers of memory and reasoning. So, in future, if you have an important examination coming up you might be able to buy another 60 megabytes of RAM and have it implanted in your brain. Or it may be possible to have language implants. Instead of spending five years learning French you can have it implanted in time for your summer holidays. You could probably pay a few dollars more to have the fashion sense module.

Ray Kurzweil, believes that by "the third decade of the 21st century, we will be in a position to create complete, detailed maps of the 'computationally relevant features of the human brain,' and to recreate these designs in advanced neural computers." There will be a variety of bodies for our machines too, "from virtual bodies in virtual reality to bodies comprising swarms of nanobots..." Humanoid robots that walk and have lifelike facial expressions have been developed in several laboratories. They have great popular appeal, as shown by ASIMO, the robot created by Honda; and Pixar's *Wall-E*. Before the end of this century, "...the law of accelerating returns tells us, earth's technology-creating species – us – will merge with our own technology. And when that happens we might ask: what is the difference between a human brain enhanced a million-fold by neural implants and a non-biological intelligence based on the reverse engineering of the human brain that is subsequently enhanced and expanded?"

As Kurzweil notes, "an evolutionary process accelerates because it builds on its own means for further evolution... The intelligence that we are now creating in computers will soon exceed the intelligence of its creators." Ostman conjectures that there may come a time "when machines exhibit the full range of human intellect, emotions and skills, ranging from musical and other creative attitudes to physical movement." In that case "the very boundaries of philosophical questions concerning where life ends and something else, yet to be defined, begins are at best soon to become a very fuzzy grey zone of definitions, as will the essence of intelligence as it is currently defined."

"An evolutionary process accelerates because it builds on its own means for further evolution."

This may sound far-fetched, but if someone had told you fifteen years ago that you could sit on the beach with a small wireless telephone and search the Library of Congress, send instant mail, download music and videos, book your holidays, arrange a mortgage and check your cholesterol, you would have thought they were being ridiculous. Now we take it for granted. If you could go back in time and hand your iPhone to your great-grandparents, they'd think you were Captain Kirk from *Star Trek*. The impossible yesterday is routine today. Wait until tomorrow.

IT'S GETTING CROWDED

Technological change is one driver of change. But there's another: the sheer numbers of people on the planet and the

shifting patterns of population. Here again we are faced with an exponential curve of change. At the beginning of the Industrial Revolution, in the middle of the 18th century, there were one billion people on earth. In 1930, there were two billion. So it took all of human history until about 1800 for the population to reach the first billion and 130 years to reach the second billion. It took only 30 years to add the third in 1960, fourteen years to add the fourth in 1974 and thirteen years to add the fifth in 1987. By the night of the millennium celebrations in December 1999, the world's population had grown by another billion and reached six billion, the most rapid increase ever. Another billion people will have been added by 2011. The United Nations estimates that on current trends the world population in 2050 will be about 9.2 billion. That is more people than have ever lived on the planet at the same time.

The issue is not only the size of the human population but also how it is changing. At the same time as the population is growing it is becoming increasingly urbanized. In 1800, the vast majority of people lived in the countryside: only five percent lived in cities. By 1900, the number had risen to twelve percent. By 2000, almost 50 percent of the six billion people on earth lived in cities. It's estimated that in 2050, over 60 percent of the population – more than five and a half billion people – will be living in cities.

These will not all be the small, manicured, well-regulated cities of the American Dream. Many will be vast, sprawling mega cities (that is, a metropolitan area with a population of over ten million people) with vernacular housing created by the people who live there from the raw materials they have at hand. The numbers are daunting. It's estimated that by 2050 there will be over 500 cities with more than a million people and over 50 mega-cities with populations of more than 50 million. Already, Greater Tokyo has a population of 34.6 million, which is more the entire population of Canada, gathered in one urban metropolis.

At the same time, the human world is shifting on its axis. The most significant growth in population is not in the old industrial economies of Western Europe and North America; it is in the emerging economies of South America, the Middle East and Asia. Currently, 84 million people are being added every year to the populations of the less developed countries, compared with about one and a half million in more developed countries, where populations are projected to remain relatively constant throughout this century.⁶ China is the world's most populous nation with a population of 1.3 billion. Its population is increasing by one percent each year, assuming minimal migration. India's population is now approaching 1.2 billion. With a higher annual growth rate of about two percent, India is likely to surpass China as the world's most populous country by the middle of the century.

In some countries, including those of the emerging economies, almost half the population is under 25. In others, especially the older industrialized countries, the population is aging.⁷ Many are experiencing extremely slow growth and even natural decrease because death rates have risen above birth rates. By mid 2010, deaths exceeded births in thirteen European countries including Russia, Germany, Latvia and Serbia.⁸

In some countries net immigration provides the only population growth. The United States is the third most populous nation in the world, behind China and India with a current population of 309 million. An estimated 4.3 million babies were born in the USA during 2007 and the population increased by an estimated 1.2 million people. According to the US Census Bureau projections, the US population could reach 422 million by 2050. The main growth in the population is through patterns of migration from Central and South America.⁹

As this century progresses, these massive changes in the numbers and distribution of the world's human populations will put intense pressure on natural resources, and especially water, on food supplies and its means of production, on energy and on the quality of air and the atmosphere. We will face bigger risks than ever from potential epidemics and new forms of disease. There will be profound effects on the structure of economic activity and trade. And, if the past is any guide, we will be at risk too from the persistent perils of cultural conflict and myopia.

Responding to these massive shifts in population will demand radically new ways of caring for natural resources, new technologies for generating energy, new and sustainable methods of food production and new approaches to both the prevention and treatment of diseases. Here, as everywhere, innovation is critical.

THE PERILS OF PREDICTION

It is all but impossible to predict the future of human affairs with any certainty. The forces of change create far too many currents and crosscurrents to chart them more than a little way ahead. Take the effects of technology, for example. The effects of transformative technologies are hard to predict for the very reason that they are transformative. To understand how hard it is to anticipate the future now, we need only think of how difficult it

proved to predict the future in the past.

Getting the picture

On Sunday April 30 1939, the President of the United States, Franklin D Roosevelt, stood before an audience of over 200,000 people in Flushing Meadows, Queens, just east of New York City, and steadied himself at the podium. As he did so, an unusual camera was trained on him for the first time. His role that day was to open formally the 1939 New York World's Fair. The theme of the Fair was 'Building the World of Tomorrow' and during its two seasons of activity in 1939 and 1940 it attracted 45 million visitors. Among the hundreds of exhibits was the pavilion of RCA, the Radio Corporation of America. The pavilion featured demonstrations of the world's first commercial system of television. Roosevelt's speech that day was the first presidential speech to be televised. In addition to the audience at the Fair he was watched by about a thousand people gathered around a few hundred TV sets in various buildings in New York City. Ten days before the official opening of the Fair, David Sarnoff, the President of RCA, gave a dedication speech for the RCA pavilion in which he heralded the system of television as the dawn of a new age of broadcasting. The pavilion attracted huge interest. But not everyone was convinced that the new medium would catch on.

An article in the *New York Times* concluded that, "Television will never be a serious competitor for radio." If you're listening to the radio, you can get on and do other things. To experience television, the *Times* argued, "People must sit and keep their eyes glued on a screen." Ironically, of course, this was to become the very attraction of the whole system. Nonetheless, it seemed clear to the writer that, "The average American family doesn't have time for it." Well, they found time. On average, the average American family went on to squeeze about 25 hours a week from their busy schedules to sit and keep their eyes glued on the television.

The fault line in the *Times*' assessment of television was to judge it in terms of contemporary cultural values where there seemed to be no place for it. In fact, television was not squeezed into existing American culture: it changed the culture forever. After the arrival of television, the world was never the same place again. Television proved to be a transformative technology, just as print, the steam engine, electricity, the motorcar and others before it had been.

Turning the page

As Johannes Gutenberg worked to iron out the technical wrinkles of his invention in 1450 in Mainz, Germany, I doubt that he anticipated the full consequences of the printing press that he was about to unleash on the world. A goldsmith by training, Gutenberg, blended existing technologies and added refinements of his own to develop a system of printing that was quick, adaptable and commercially efficient. His system made it possible for the first time to reproduce documents in volume and for them to be distributed far and wide across the continent and then the world. His printing press changed everything. His system opened up the world of ideas to everyone, and generated an unprecedented appetite for literacy and knowledge: an appetite that was to have seismic consequences for politics, religion and culture and that reshaped the world.

By 1500 there were printing presses rattling across Europe, pumping out millions of documents from pamphlets to books on every subject and from every religious, political and philosophical point of view, with significant ramifications – as I will explain in Chapter 4. In the sixteenth century, the English philosopher and politician Sir Francis Bacon developed the basic principles of the scientific method. He did so in a world that had been transformed by the proliferation of ideas and intellectual energy that had flowed from the printing presses of Europe. Towards the end of his life, Bacon commented that the advances in printing that Gutenberg had made had "changed the whole face and state of things throughout the world." Only now, almost 600 years later, is the future of the printed book under threat from e-technology, in the form of digital downloads.

Getting around

Created 400 years after Gutenberg's first printing press, the potential of the internal combustion engine was initially underestimated. It struck many people as an interesting innovation, but some struggled to see why it would replace horses and carriages, which seemed to do a perfectly good job of getting people around. One person whose curiosity was piqued by the new horseless carriages occupies an unfortunate place in the history of transportation. Her name was Brigit Driscoll. She was one of the first to be killed in an auto accident.

On 17 August 1896, Bridget, who was then aged 44, was visiting an exhibition at the Crystal Palace in London with her teenage daughter, May. The exhibition included demonstration rides by the Anglo-French Motor Carriage Company. As she was walking through the grounds, Mrs Driscoll was struck by one of the vehicles and died of her injuries. The case was highly unusual and was referred to the Coroner's Court for proper consideration. The jury was faced with conflicting accounts of the exact circumstances of the accident, including the actual speed of the vehicle. One of the witnesses to the accident said that the vehicle had been moving at "a reckless pace, in fact like a fire engine." The driver, Arthur James Edsall, denied this and said that he had been traveling at only four miles per hour. His passenger, Alice Standing, said that the engine had been modified to make the car move faster than four miles an hour, though an expert witness who examined the vehicle contradicted this allegation.

After deliberating for six hours, the jury returned a verdict of accidental death. Summarizing the case, the coroner, Mr Percy Morrison reflected on the bizarre nature of this tragic episode and said he hoped "such a thing would never happen again." Well, it happened again. More than 20 million people have now lost their lives in accidents involving motorcars. Like the printing press, the motorcar changed the world in ways that its inventors could not have imagined.

Making connections

In our own times, digital culture is changing the world just as profoundly as these earlier technologies have done. And the effects are cumulative. Radical innovations often interact with each other and generate entirely new patterns of behavior in the people who use them. When Tim Berners-Lee developed the original software for the World Wide Web in 1990, his aim was simply to help academics research each other's documents. He could not have foreseen the mushrooming expansion of the Internet and the viral growth of social networking sites like Facebook and Twitter, with their profound effects on culture and commerce. The evolution of the Internet has been driven not only by innovations in technology but also by unleashing the imaginations and appetites of millions of users, which in turn are driving further innovations in technology.

New work for old

We can't predict the future. But some things we do know. One is that the nature of work will continue to change for very many people. Our children will not only change jobs several times in the lives but probably careers. In less than a single generation, the nature of work for millions of people has changed fundamentally, and with it the structure of the world economies. When I was growing up in the 1950s and 60s, the majority of people did manual work and wore overalls: relatively few worked in offices and wore suits. In the last 30 years especially, the balance has been shifting from traditional forms of industrial and manual work to jobs that are based on information technology and providing services. The dominant global corporations used to be in industry and manufacturing: many of the key companies today are in communications, information, entertainment, science and technology.

The emergence of e-commerce and Internet trading in the 1980s swept away long-established ways of doing business. The computerization of the financial markets and the synchronization of the global economies revolutionized financial services, including banks, insurance companies, stockbrokers and dealers. Since the so-called Big Bang in London in 1988, international corporations have swallowed up smaller traditional banks, retail stores have offered financial services of their own, and banks have become insurance and mortgage brokers.

At the beginning of the e-commerce boom, Lou Gerstner, Chief Executive of IBM, estimated correctly that companies would invest billions of dollars globally on e-business, not on hardware or software but on consultancy. In 2000, McKinsey claimed to have more than 60 percent of its London consultants employed on e-commerce projects. In 1998 it had been fewer than ten percent. Traditional business consultancies saw staff turnover rates rising rapidly as people defected to Internet-based companies. Turnover in some companies was as high as 40 percent. More venture capital in all categories was dispensed in the two years from 1998 to 2000 than in the previous ten. Along the way, some e-commerce organizations became extraordinarily valuable. Cisco Systems supplies networking equipment for the Internet. In November 2000 its stock market value was \$400 billion, making Cisco worth more than the combined value of all of the world's car companies, steel makers, aluminum companies and aircraft manufacturers at that time.

On the other hand, some venture capitalists spent the three years from 1997 to 2000 pouring billions of dollars into

Internet-based companies that soon disappointed their expectations. A great deal of this money was misplaced and lost, in part because in their frenzy to invest in the new forms of trading, many business people and investors alike overlooked some of the basic principles of business. The stock market soon loathed these companies and in time “99% of venture capitalists wouldn’t even read their business plans, much less cough up money for them.”

The heady expansion of the financial services sector in the five years from 2000 and its subsequent precipitous collapse in 2008 was a further illustration, if we needed one, that the course of human affairs, in business as elsewhere, usually defies prediction and often beggars belief.

Getting the idea

In the last 30 years too, there has emerged a powerful new force in the world economies. Often described as the intellectual property sector or sometimes as the creative industries, they include advertising, architecture, arts and antiques, crafts, design, fashion, film, leisure software, music, performing arts, publishing, software and computer services, television and radio. The intellectual property sector is even more significant when patents from science and technology are included: in pharmaceuticals, electronics, biotechnology, and information systems among others. All of these technologies are based on fundamental advances in the sciences and in engineering.¹⁰

The creative industries are labor-intensive and need many different types of specialist skill. Television and film production for example, draws on a variety of specialist roles in performance, in script writing, in camera and sound operation, in lighting, makeup, design, editing and post-production. As the financial significance of this sector grows, so does its employment base. The creative industries are also expanding in other countries, notably in the UK.

The communications revolution, and the new global markets it has created, has multiplied outlets for creative content and increased consumer demand. These new forms of work are creating a demand for new sorts of skill and aptitude. Unlike many other sectors, the creative industries continue to have high growth rates, mainly because they now encompass the fast-growing software, computer games and electronic publishing sectors.¹¹

Old workers for new

Throughout the world, business and education are faced with a new generation gap. While the total number of people on earth is increasing, there are profound differences between generations. As healthcare improves and life expectancy increases, the boomers are continuing to boom in size and energy. In the UK, for example, by 2020 the number of people over 50 will have increased by two million. Meanwhile, the number of those under 50 will have dropped by two million. Employers who look to young workers as their traditional source of labor may find the spring is running dry. Fortunately, those now passing 50 are not like their predecessors from generations past. They account for 80 percent of the nation’s wealth, enjoy better health and are more inclined than the heavily mortgaged parents of young children to take on new challenges and adapt to new ways of working. This makes them highly effective new-economy workers.

As one study puts it: “Declining birth rates mean that employers are going to have to become more creative if they want to access the knowledge workers they need. And that means abandoning the lazy prejudice of age discrimination.” In the United States, the numbers of workers paid for work at home rose from 1.9 million in 1991 to 3.6 million in 1997.¹² A report commissioned by the Trades Union Congress (TUC) in the UK in 2010 estimates that as many as one in eight people now earn a living from home. That’s 12.2 percent of the population, or an increase of 600,000 in three years.¹³

THE LEISURED SOCIETY?

Digital technologies are blurring the boundaries between home and work, business and pleasure. The tendency to communicate across time zones means that just as you’re going to bed someone has just arrived at their office and is logging on. Emails pile up. The compulsion to answer the cellphone implies that the incoming call is more important than the face-to-face conversation you were having. I don’t know many people who are working less hard than they were ten years ago. Most are working faster with more to do and to shorter deadlines.

There is also an unprecedented deluge of news and information and an insistent pressure to keep abreast of it all. A

well-known British journalist was reminiscing about his early days in radio news. He joined the BBC in the 1930s at a time when there was no regular news bulletin. In his first week, a bulletin was scheduled and he arrived at the studio to watch it being broadcast. The presenter sat at the microphone and waited until the time signal had finished. He then announced somberly: "This is the BBC Home Service from London. It is one o'clock. There is no news." The view of the times was that news would be broadcast if anything happened to warrant it.¹⁴ Compare this with our own saturated processes of news reporting 24 hours a day on a multitude of channels and media. It isn't that there is more happening in the world now than there was in the 1930s. But there is now a ferociously hungry news industry, which generates, and sometimes manufactures, news stories around the clock to nourish its own bottom line. All of this adds to the general sense of crisis that permeates 21st-century culture.

A senior executive in a major oil company told me that the wind-down to Christmas used to begin in mid-December and the recovery might run on to the middle of January. Now people are fixing meetings in Christmas week and the whole operation speeds back in to action in the first week of the New Year. As he put it, "Standards of living are much higher than when I started out, but the quality of life is lower." Meanwhile many other people have no work at all. This is a different proposition that I will come back to in Chapter 3.

ANTICIPATING THE FUTURE

In 1974 Alvin Toffler published his groundbreaking book *Future Shock*. The idea of culture shock is well known to psychologists. It can happen to people who find themselves in an environment where all their normal reference points – language, values, food, clothes, social rituals – are gone. Political refugees and economic migrants can experience culture shock when they move to a new country. This experience can be profoundly disorienting and can lead in extreme cases to psychosis. Toffler saw a similar global phenomenon in the effects of rapid social change promoted by technology. He argued that being propelled too quickly into an unfamiliar future could have the same traumatic effects on people. The issue was not the fact of change: it is the rate and scale of it.

"Civilization is a race between education and catastrophe."

H.G. Wells

In our time we have released a totally new social force, "a stream of change so accelerated that it influences our sense of time, revolutionizes the tempo of daily life, and affects the very way we feel the world around us. We no longer feel life as people did in the past. And this is the ultimate difference, the distinction that separates the truly contemporary person from all others." This acceleration, he believed, lies behind "the impermanence, the transience, that penetrates and tinctures our consciousness, radically affecting the way we relate to other people, to things, to the entire universe of ideas, art and values." Interestingly, in the 1970s when Alvin Toffler was developing his apocalyptic views on the rate of social change, the personal computer wasn't available, let alone the Internet. He wrote *Future Shock* on a manual typewriter.

LOOKING FORWARD

In the 21st century humanity faces some of its most daunting challenges. Our best resource is to cultivate our singular abilities of imagination, creativity and innovation. Our greatest peril would be to face the future without investing fully in those abilities. Doing so has to become one of the principal priorities of education and training everywhere. Education is the key to the future, and the stakes could hardly be higher. In 1934, the great Swiss psychologist Jean Piaget said, "only education is capable of saving our societies from possible collapse, whether violent or gradual." History provides many examples of his point. Over the course of humanity's relatively brief occupancy of the earth, many great societies and whole civilizations have come and gone. We build our own cultures not only on the achievements of those that have come before but on their ruins. The visionary novelist, H.G. Wells, put Piaget's point even more sharply: "Civilization," he said, "is a race between education and catastrophe." All the evidence is that he and Piaget were right. The problem is that too often, and in too many ways, current systems of mass education are a catastrophe in themselves. Far from looking to the future, too often they are facing stubbornly towards the past.

CHAPTER 3

THE TROUBLE WITH EDUCATION

“Current systems of education were not designed to meet the challenges we now face. They were developed to meet the needs of a former age. Reform is not enough: they need to be transformed.”

ONE OF THE MAIN REASONS that so many people think they are not creative is education. Picasso once said that all children are born artists: the problem is to remain an artist as we grow up. Creativity is not solely to do with the arts or about being an artist, but I believe profoundly that we don't grow *into* creativity; we grow *out of* it. Often we are educated out of it. Creativity is a multi-faceted process. It involves many ordinary abilities and some specialized skills and techniques; it can be fostered by many different ways of thinking, and it draws on critical judgement as well as imagination, intuition and often gut feelings. The dominant forms of education actively stifle the conditions that are essential to creative development. Young children enter pre-school alive with creative confidence; by the time they leave high school many have lost that confidence entirely. It is important to understand why and how this happens. There are ways in which adults can rekindle creativity in themselves and others. But if creativity is to become central to our futures, it first has to move to the heart of education.

REFORMING AND TRANSFORMING

As the technological and economic revolution gathers pace, education systems throughout the world are being reformed. These reforms almost always focus on ‘improving’ the existing system. Most countries have a dual strategy. The first is to increase access to education; especially the numbers of people who go to college. The demand for educational qualifications grows annually; education and training are now among the world’s largest businesses.

The second strategy is to raise standards. Educational standards *should* be high and it is obviously a good idea to raise them. There is not much point in lowering them. But standards of what? Educating more people and to a much higher standard is vital. But we also have to educate them differently.

Education is not an impartial process of developing people’s natural abilities and it never was. Systems of mass education are built on two pillars. The first is economic: they have been shaped by specific assumptions about labor markets, many of which are now hopelessly out of date. The second is intellectual: they have also been shaped by particular ideas about academic intelligence, which disregard other abilities that are just as important, especially for creativity and innovation. Perhaps the most powerful indicator of the need for transformation is the phenomenon of academic inflation.

ACADEMIC INFLATION

I went to college in 1968 and left in 1972. I did not look then as I look now. I was not the suave sophisticate that you will find on my website. I was deep into the heavy rock music of Led Zeppelin and, visually at least, I was channeling the lead singer, Robert Plant. I had shoulder length hair, wore jeans and a torn combat jacket, and was almost dangerously attractive to women. That was certainly my impression. I was 22 and considering my options. Should I get a job? Not yet, I thought. There was no rush. At that time, college graduates were virtually guaranteed a decent job and it didn’t matter much what their degree was in. It could have been in Old Norse and it often was. Employers would still snap them up. “You can speak Viking,” they’d say, “come and run our factory: your mind is obviously honed to a fine edge.”

In the 1970s and 1980s, a college degree was a passport to employment. If you did well in school at that time, and

especially if you went to university, you were assured of a secure job. If you had a degree and did not have a job, it was probably because you didn't want a job. And I didn't want a job. I wanted to 'find myself'. You could do this in the 1970s. So I decided to go to India, where I thought I might be. I didn't get to India, as it happens; I got to London (where, to be fair, there are a lot of Indian restaurants). But I knew that whenever I wanted a job I could get one, and soon enough I did.

In 1950, students with good high school qualifications expected a life of stable employment, perhaps staying with the same company until retirement. That is unlikely now. In some ways you are still better off with a degree than without one, but it will only get you started in the job market: it doesn't give you security once you are there. Graduates who find work in 2012 will not expect to be with the same company in 2050, or even that the company will still be around then. They may change not only jobs but also careers several times during their working lives.

There are many good reasons for gaining academic qualifications. The process should be inherently worthwhile and the best programs are. But academic qualifications are also a form of currency: they have an exchange rate in the market place for jobs or higher education. Like all currencies, their value can go up or down according to market conditions and how much currency is in circulation. University degrees used to have a high market value in part because relatively few people had them. The growth in population combined with the expansion of professional and administrative work means that unprecedented numbers of people are now going to college. In the 1970s, about 1 in 20 people in the old industrialized economies went to college. The current target is one in three, rising to one in two.

According to UNESCO, the number of people gaining formal educational qualifications in the next 30 years will exceed the gross total since the beginning of history. As a result, the market value of degrees is tumbling. Something more is needed to edge ahead of the crowd. Jobs that used to require only a first degree are now asking for masters' degrees, or even doctorates.

Several years ago, I was on a university appointments panel. I asked the chairman of the panel what we were looking for in the candidates. He mentioned the various qualities and qualifications that were essential for the job and then he said, "I think we're also looking for someone with a good PhD." I said, "A what?" He said, "A good PhD." "As opposed to what?" I said, "A dreadful one?" What he meant was someone with a PhD from a high-ranking university. There was a time when, if you had a PhD, you were in a tiny fraction of the population. All PhDs were regarded with reverence. Postgraduates were kept in a separate room and fed on plasma. Children were brought in to look at you and told this is what could happen to them if they didn't get out more. Now, we're getting picky. We want applicants to have *good* PhDs. What's the next twist on this spiral? Nobel Prizes? Will we eventually see Nobel Laureates applying for clerical jobs and being told, "OK, you've got a Nobel Prize, that's lovely. Can you also handle Excel? We need someone to sort out the payroll."

The current assumption is that by expanding education and raising standards all will be well. The end game assumes that when everyone has a PhD, there will be a return to full employment. But there won't. The markets will reconfigure as the currency rates fall and employers will look for something else. They are doing this already. The issue is not that academic standards are falling. The real issue is that the very foundations upon which our current systems of education are built are shifting beneath our feet.

TWIN PILLARS

The political impetus to develop national systems of education was not purely philanthropic or humanitarian: it was also economic. It arose out of the surging demands of the Industrial Revolution. The education systems that emerged were not only designed in the interests of industrialism, they were created in its image in terms of both structure and culture.

The factory floor

We now take it for granted that governments should provide mass systems of education; that they should be funded from the public purse; that all young people should go to school until they are at least 16 and that a high proportion of them should go on to college. As obvious as they may seem now, these assumptions are relatively new.¹ It was only from the 1860s onwards that countries throughout Europe, as well as many of the American states, began to establish mass systems of public education. The history of state education everywhere is an intricate tapestry of practical economic needs, individual philanthropic passions, of competing movements of social reform, and widely differing

economic needs, individual philosophical passions, or competing movements of social reform, and widely differing philosophical convictions. There were though, some common driving forces.

In many countries, the spread of industrialization in the nineteenth century radically changed the face of the labor force and created entirely new social structures. Pre-industrial societies were dominated by the interests of the old aristocracies and the churches; which presided over largely illiterate, usually poor rural populations. Before the 1860s, the vast majority of Europeans were still illiterate. Only Prussia, some of the other northern German states, and the Scandinavian kingdoms boasted widespread literacy.² The rise of industrialism generated enormous new streams of wealth and an entirely new social force: the wealthy and aspiring middle classes.

Education was seen as the essential route to social improvement and further economic opportunity. Education was also vital to generate the conditions for long-term economic prosperity. The growth of public education was shaped around the interests the middle classes, and their ambition not only for themselves but also for the industrialized societies they were helping to create. For the first time, industrialism also provided the financial resources to pay for systems of mass education.

As millions of workers migrated from the countryside to the cities, to stoke the fires of industrialism in the factories and shipyards, a third social group began take shape: the urban working classes. For some pioneers of mass education, schools were a way to raise the aspirations of the working classes and to lift them out of poverty and despair. Others saw education as the best way to promote the values and opportunities that are meant to lie at the heart of healthy democracies. In the United States, Horace Mann saw education for all as the natural fulfillment of the principles of the Constitution. Others saw mass education less idealistically as the most efficient way of inculcating the working classes with the habits and disciplines that were essential to industrial production.

For all of these reasons, systems or state-supported and state-directed elementary schools sprang up throughout Europe in the late 1860s, 1870s and 1880s. Such systems were inaugurated in Hungary in 1868; Austria, 1869; England, 1870; Switzerland, 1874; the Netherlands, 1876; Italy, 1877; and Belgium, 1879. According to Professor Gerald Gutek, by the time of the Civil War, “the common school movement in the United States had accomplished its aim of achieving popular systems of elementary schools in most of the states. After 1865, schools were established in the southern states. As various new states entered the Union, they too established common elementary school systems.”³

Some skeptics argued that it was waste of public resources to attempt to educate the children of the working classes: such children were essentially uneducable and would not benefit from these efforts. They were wrong about that. Others feared the social and political consequences: educating the working classes would give them ideas above their station and lead to a social revolution. They were not wrong about that.

From the outset, education systems in Europe and North America were designed to meet the labor needs of an industrial economy based on manufacturing, engineering and related trades, including construction, mining, and steel production. Broadly speaking, industrialism needed a workforce that was 80 percent manual and 20 percent administrative and professional. This requirement had a deep influence on the structure of public education systems. Typically the educational model was shaped like a pyramid, with a broad base of elementary education funneling to a narrow peak of higher education. The vast majority of children went to elementary school and a smaller but still significant number went on to high school. The majority of young people left full-time education at 16, to find work. A small proportion went on to higher education. Those with strong academic qualifications went to universities, others to trade colleges or polytechnics.

In Europe, high schools were usually of several different types: academic schools for a minority of pupils who showed an aptitude for such work; and more practical or technically oriented schools for the majority who did not. Although national policies emphasized the value of all types of school, the academic schools, which fed the universities, had higher status, and so did the students who went to them. It was not that only a minority was capable of going to university: the supply of places was limited by the needs of the labor markets.

As these needs have changed, so the number of places in higher education has increased. In the United States and Europe, the expansion began in the 1960s, partly to accommodate the bulging population of baby boomers after the end of World War II. This trend has continued with the burgeoning demands of the so-called knowledge economy. From the beginnings of state education in the United Kingdom, the expansion of academic ‘grammar’ schools went hand in hand with the founding of new universities in the major industrial centers.⁴ Between 1954 and 1966, the numbers of school leavers qualifying for university entrance rose from 24,000 to 66,000. During the 1960s, 23 new universities were established in the UK to meet the demands of the baby boomers, culminating in the creation of the Open University, which provided university-level education for all, via distance learning. Two-thirds of British

universities were founded after 1960 when the polytechnics became eligible for university status.

There was a similar pattern of expansion in the United States. Some American universities such as Indiana, Madison Wisconsin and Ohio State are now the size of small towns and are turning out graduates in tens of thousands every year.

The number of young people capable of achieving university level education has increased over the last 40 years from one fifth to at least 50 percent. What happened during this period to account for this remarkable change in intellectual capacity? Is it the fluoride in the water or the rise of organic farming? The fact is that most young people have *always* been capable of higher academic study; but, until recently, graduates just weren't needed in such large numbers.

THE CULTURE OF EDUCATION

The rise of industrialism influenced not only the structure of mass education but also its organizational culture. Like factories, schools are special facilities with clear boundaries that separate them from the outside world. They have set hours of operation and prescribed rules of conduct. They are based on the principles of standardization and conformity. Students within the academic system are taught broadly the same material and they are assessed against common scales of achievement, with relatively few opportunities for choice or deviation. Typically, they move through the system in age groups: all the five-year-olds together, all the six-year-olds together and so on, as if the most important thing that children have in common is their date of manufacture. In high schools, the day is organized into standard units of time and the transitions are marked by the ringing of bells or buzzers. Teaching is based on the division of labor. Like an assembly line, students progress from room to room to be taught by different teachers specializing in separate disciplines.

Education systems also operate on the manufacturing principle of linearity; in that there are distinct sequential stages to the process. Each stage is meant to build logically on the one that precedes it; overall outcomes can be predicted with reasonable reliability. The idea is that if students progress in the prescribed way through the system, and especially if they complete college, they will emerge at the far end educated and prepared for whatever the world throws at them.

When I first moved to Los Angeles, I saw an egregious example of the linear principle in the form of a discussion paper for education entitled, "College begins in Kindergarten." There's a lot more to say on this issue of linearity but let me simply say here that college *does not* begin in kindergarten. Kindergarten begins in kindergarten. The director of The Ark Children's Theatre in Dublin once made a wonderful comment on this theme. "A three-year-old," he said, "is not half a six-year-old. A six-year-old is not half a twelve-year-old." Three-year-olds are three. The obsession with getting to college is now pushing down through the system to distort even the education of preschoolers. In some urban centers the competition is so intense for places in the 'right' kindergartens that children are being interviewed – for kindergarten. What are the interviewers looking for, evidence of infancy?

Embedded in this principle of linearity is the idea that education is essentially a preparation for something that happens later on. It is for this reason that education is still mainly focused on children and young people. This system is sometimes called the front-loading model of education: you accumulate your educational resources at the beginning of your life and you eke them out gradually as you get older. I have also heard it called the gas tank model: you are filled up in your youth with an initial supply of education, which is meant to see you through the rest of life's journey. In practice, of course, most people leave school with half a tank; it's basic grade and there are too few gas stations if they run out en route.

It is worth pausing at the analogy with motorcars. Some policy makers talk about reforming education as if they were sorting out the auto industry. They emphasize the need to get back to basics and focus on the core business, to face up to overseas competition and to raise standards, improve efficiency, return on investment and cost-effectiveness. The difference of course is that motorcars and other lifeless products have no interest in how they are produced. People on the other hand are keenly interested in their own experiences in education. They have feelings and opinions, values and motivations, hopes and aspirations. Ignoring the human factor is at the root of many of the problems that industrial systems of education have created.

Education is not only a preparation for what may come later; it is also about helping people engage with the present. What we become as our lives evolve depends on the quality of our experiences here and now. Linear

assumptions about supply and demand cut off many potentially valuable experiences on the grounds of utility. For most people there never has been a direct, linear progression from education to planned career. Our lives are too buffeted by the currents and crosscurrents of social forces and personal impulse. Life and work are shaped by an unpredictable mixture of events and opportunities, which make sense only retrospectively when writing a curriculum vitae. At which point the basic human urge for narrative takes over, turning the chaotic process of randomness and chance into a well-crafted account of your sleek trajectory through life.

The assumption that there is a direct linear relationship between general education and subsequent employment puts schools under pressure to prioritize those subjects that seem most relevant to the economy. It is argued that there is a need to produce more scientists and technologists. Consequently, science and technology are given higher priority and greater funding in schools, while provision for the arts and humanities is cut back to make way for them. This is the pattern in most developed countries. There are good reasons to doubt whether this policy is in the best interests of young people or of society in general; or even whether it is the best way to produce good scientists and technologists. In any case, it is a mistake to think of the relationship between education and the economy as a straightforward process of supply and demand, like producing motor cars. While industrial systems may be standardized, mechanistic and linear, human life simply is not. Our lives run on entirely different principles.

What's the use?

In almost all industrial systems there is the same hierarchy of disciplines in high schools, and increasingly in elementary schools too. At the top are mathematics, languages and sciences; some way down are the humanities – history, geography and social studies – and physical education; at the bottom are the arts. There is another hierarchy within the arts: art and music usually have higher status than theatre and dance. There isn't a school system in the world that teaches dance every day as a compulsory discipline in the way that mathematics is taught. The hierarchy shows itself in the amounts of time that are given to different disciplines; whether they are compulsory or optional and for whom; whether they are in the mainstream curriculum or after school; whether they are included in standardized tests and how much they feature in political polemics about raising standards.

The Council of Europe is an intergovernmental organization based in Strasbourg. It works with member states across Europe including many of the former Soviet Bloc countries. As part of a project that I directed for the Council of Europe, I surveyed education systems in 22 countries.⁵ Someone has to do this sort of thing. There were many differences in education in these countries and many similarities. In all of them, the arts are on the edges of the school curriculum. Most systems include some art and music in the formal curriculum; very few teach drama and hardly any provide dance lessons. The pattern is the same in the United States, Canada, Mexico, Central and South America and in many parts of Asia. In fact, almost everywhere. Whatever the standards are that most countries want to raise, they don't seem to have much to do with what the arts teach. I know this from my own school experience.

When I was 14, my class teacher told me that I had a problem and sent me to see the head teacher. The issue was my choice of options for the next two years of school. I loved art and was very keen to carry on with it. I also wanted to take German. "Well, you do have a problem, Robinson," the head teacher said. "I'm afraid you can't do art and German." I was baffled. I'd seen films about Germany and there seemed to be pictures everywhere. "No," he said, "you can't do art and German here in this school. They clash on the timetable." I asked him what I should do. "If I were you," he said, "I should do German." I asked him why, and he said, "It will be more useful." I found this exasperating and still do.

I'd have understood if he'd said German would be more interesting; or that I had an obvious feel for languages, or that it would suit me better. But why is German more useful than art? I know it is useful, especially in Germany. Languages are very useful but is art not? Is it useless? The curricula of most school systems seem to divide into two broad groups: the useful disciplines and the useless ones. Languages, mathematics, science and technology are useful; history, geography, art, music and drama are not. When funding is tight or reform movements focus on raising standards, arts programs are usually cut.

In 2001, the Federal Government of the United States passed into law the Elementary and Secondary Education Act (ESEA) generally known as 'The No Child Left Behind Act, 2001' (NCLB). Its aims were to raise academic standards in all schools, to make teachers accountable for student achievement, to raise levels of college preparedness and in these ways to reinvigorate the economic competitiveness of the USA. The principal methods were to intensify programs of standardized testing for languages and mathematics and to link funding for schools to students' performance on the tests. NCLB was the result of a cross-party coalition; it was composed by serious people with the

best interests of the country in mind and its intentions were admirable. In practice, it has largely failed to meet its own objectives and has been widely condemned for demoralizing teachers and students, for inculcating a numbing culture of teaching to the test, and for encouraging schools to adapt the testing systems to avoid financial and other penalties. Meanwhile students are dropping out and teachers are leaving schools at alarming rates, while overall achievement in literacy and mathematics has scarcely budged. In the process, provision for the arts and for the humanities in American schools has been devastated.

According to one study,⁶ since NCLB was passed into law, almost half of the school districts have eliminated or seriously reduced their arts programs, and the associated teaching posts. Policy makers emphasize that devastating arts education was not the intention of the legislation. I'm sure it was not intentional. I don't imagine that serious politicians huddled in the committee rooms of Congress planning the downfall of the nation's piano teachers or deciding that dance educators were getting out of hand and had to be curbed. The arts suffered from collateral damage. The minds of the policy makers were focused on the disciplines at the top of the hierarchy. NCLB is a prime example of what some holistic doctors call the septic focus: the tendency to look at a problem in isolation from its context.

THE SEPTIC FOCUS

I had a friend, Dave, who was an actor. He was a large actor, weighing about 20 stone or 280 pounds. He liked to drink beer and had a particular taste for a brew called Abbot Ale. This is a powerful drink. You could run a small car on Abbot Ale, or a large actor. Dave regularly drank 12 pints of it a day. Some years ago he developed back pain and went to his doctor, who referred him to a kidney specialist. The specialist examined him and said that he had potentially serious kidney problems. Dave asked what could be causing it. "It could be a number of things," said the consultant. "Do you drink?" David said that he did, socially, and mentioned the Abbot Ale. The specialist told him he would have to stop drinking or face the prospect of renal failure. Dave said he couldn't stop drinking: he was an actor. "In that case," said the specialist, "why don't you change to spirits?" Dave said he thought that spirits could cause cirrhosis of the liver. "But you haven't come to see me about your liver," said the specialist, "I am concerned about your kidneys."

This is a clear example of septic focus. A holistic doctor would have recognized that the problem in Dave's kidneys was a result of wider factors in his overall lifestyle. Solving one problem by causing another is no solution at all. The septic focus is clearly evident in the education reform movements like NCLB that focus on certain parts of the system while neglecting the system as a whole.

Why *do* the disciplines at the top of the hierarchy get all the attention? Why does this hierarchy exist in the first place? The first answer is economic: some disciplines are simply assumed to be more relevant to the world of work and to command a higher rate of pay when finding a job. Generations of young people have been steered away from the arts with benign advice about poor job prospects: "Don't do art, you won't make it professionally as an artist." "Don't take music, you won't make a living as a musician." Benign advice maybe, but it is now profoundly wrong, as we will see. The arts are often thought to be important in schools for other reasons: as opportunities for creativity and self-expression or as leisure or 'cultural' activities. But when times are hard, many people take it for granted that the arts are not relevant to the hardheaded business of making a living.

We live in times when the sciences are strongly associated with truth and objectivity, fact and hard reality, and the arts with feelings, emotions and intuition. The arts are seen as disposable extras in education; something optional to do with self-expression, relaxation and leisure. I remember having an argument on television about this with a prominent British politician. He said that the arts are really important because they help to educate people for leisure. One of the many problems with this argument is that leisure is relative to work. If you have less work, you may have more leisure, but if you have no work, you are unemployed. That is quite a different feeling. At the time of our debate there were something like two million people in the UK who were unemployed. They were not organizing themselves, to the best of my knowledge, as the new leisure classes.

There is another reason for the hierarchy of disciplines. After all, children are not usually told, "Don't do math, you're not going to be a mathematician," or "Don't take science, you won't make it as a scientist?" The second reason is cultural. The disciplines at the top of the hierarchy are assumed in some ways to be inherently more important. This assumption is not to do with economics: it has to do with cultural ideas about knowledge and intelligence. These ideas have dominated our ways of thinking for the past 300 years. If one pillar of conventional

education is industrialism, the second is academicism.

The ivory tower

In everyday language ‘academic’ is often used as a synonym for ‘education’. Politicians talk routinely about raising ‘academic standards’ as if this means ‘educational standards’ in general. People use the term ‘academic ability’ to mean ‘intelligence’. It is not the same thing at all. Academic work focuses on certain sorts of verbal and mathematical reasoning: on writing factual and critical essays, verbal discussions and mathematical analyses. These are all very important forms of ability. But if human intelligence was limited to them, most of human culture would never have happened. There would be a lot of analysis but not much action. There would be no practical science, no technology, no functioning businesses, no art, no music or dance, no theatre, poetry, love, feelings or intuition. These are large factors to leave out of an account of human intelligence. If all you had was academic ability, you couldn’t have got out of bed this morning. In fact, there wouldn’t have been a bed for you to get out of. Nobody could have made one. They could have written about the theoretical possibility of a bed, but not actually constructed the thing.

There is an interesting ambiguity in cultural attitudes to academic achievement. On the one hand academic achievement is thought to be absolutely essential to individual success and to national survival. If academic standards are thought to be falling, media pundits beat their chests and politicians become resolute. On the other hand, ‘academic’ is used as a polite form of abuse. Professional academics are thought to live in ivory towers and to have no practical understanding of the real world at all. An easy way to dismiss any argument is to say that it is ‘merely’ academic.

How have we become so enthralled by academic ability and so skeptical of it at the same time? As we shall see in the next chapter, the roots of this obsession lie deep in the Enlightenment: the massive expansion in European philosophy and practical science in the seventeenth and eighteenth centuries. This movement led to a view of intelligence that is dominated by deductive reason and ideas of scientific evidence. These ideas have been reinforced since by styles of formal education in schools and universities.

One reason why academic work has come to dominate general education is that the needs of universities have shaped the culture of mass education, both directly and indirectly. The requirements of university entrance have had a direct influence on the nature of the school curriculum and on forms of assessment and public examination. The universities have affected education in many indirect ways too, not least because the teaching profession is largely made up of university graduates. In many ways, the whole process of elementary and high school education is a protracted process of university entrance. Those who go to university rather than straight into work or vocational training programs are always seen as the real successes of the system.

If you were to stand back from education and ask, “What is it all for?” you might focus first on those who seem to benefit most from its requirements and expectations. You might conclude that the primary purpose of compulsory education is to produce university professors, as they are the apotheosis of academic culture. I used to be a university professor and I have huge respect for academics and for academic life. But it is just another form of life. It should not be held up as the standard for other forms of human achievement. I know artists, business leaders, dancers, sportspeople, and many others, whose accomplishments, intelligence and humanity are as substantial as anyone I have met with a post-doctoral degree.

“Thinking of education as a preparation for something that happens later can overlook the fact that the first sixteen or eighteen years of a person’s life are not a rehearsal. Young people are living their lives now.”

Many highly intelligent people have passed through the whole of their education feeling they aren’t and many academically able people who’ve been feted by the system have never discovered their other abilities. Almost all of them have no real sense of their true creative potential. The waste of creative talent is a growing calamity.

The roles of education

Education has three main roles: personal, cultural and economic. A great deal could be said about each of these, but let me boil them down here into three basic statements of purpose, which I think are relatively uncontroversial:

- **Individual:** to develop individual talents and sensibilities

- **Cultural:** to deepen understanding of the world
- **Economic:** to provide the skills required to earn a living and be economically productive.

It is essential to keep a constant eye on all three of these roles and to promote them equally and in relation to each other. Understanding how they interconnect is the key to transforming the education system into a 21st-century process that has creativity and innovation at its center. As things stand, the industrial/academic model of education is often failing miserably in all three areas. Let me give you some examples.

ECONOMIC CHALLENGES

Education has a critical role in developing the knowledge, skills and attitudes that are essential for economic vitality and growth. There is strong evidence that the current systems of education are causing problems in all areas of the labor market; affecting major companies, small and medium-sized businesses and public institutions alike. These problems affect everybody from the top of the labor market to the bottom of it: from people who are highly qualified to those with no qualifications at all.

The overqualified

Most national policies for education are dedicated to increasing the output of college graduates. The policies may be working but too often the graduates are not. In the last 30 years the number of graduates on the job market has more than doubled. The sheer volume of graduates has generated an unexpected crisis in graduate recruitment. It's not that there aren't enough graduates to go around: on the contrary, there are too many. In many parts of the world the numbers of graduates are not being matched by a similar rise in the numbers of graduate jobs.

Graduates in China, for example, face what Premier Wen Jiabao described in 2009 as a 'grim' job market, as the global recession took a grip on the Chinese economy. Many of China's six million graduates were struggling to find work because of falling exports, factory closures and a slowdown in consumer spending, which deterred employers from hiring them. For China, graduate unemployment is a highly sensitive issue. As part of its economic strategy, the government has encouraged students to go to university to stimulate skills and consumer spending. The families of millions of students have invested heavily in their education. But at the end of 2008 about one million of that year's graduates still had not found work. Desperate graduates were applying for routine jobs in rural areas; or were looking for posts as nannies and domestic helpers in more affluent regions such as Guangzhou. Quoting a housekeeping recruitment agency, the provincial government's newspaper, *Guangzhou Daily*, reported in January 2009, that 500 or 600 people were applying for domestic jobs every month, more than 90 percent of whom were university students; including 28 masters students.¹

Graduate vacancies began to increase as the decade ended, especially in large companies, but the gap remains considerable. In the United Kingdom, in the same period, there were about 20,000 graduate opportunities per annum and about 200,000 graduates a year competing for them. Many end up applying for jobs for which they were overqualified. During the recession of the early 1980s, around thirty percent of all graduates were in non-graduate jobs early on in their careers. Levels of overqualification are even higher now.

There is a further issue for graduates. Too few have what business needs. More complex economies demand more sophisticated talent "with global acumen, knowledge of different cultures, technological literacy, entrepreneurial skills, and the ability to manage increasingly complex organizations."² Employers say they want people who can think creatively, who can innovate, who can communicate well, work in teams and are adaptable and self-confident. They complain that many graduates have few of these qualities. It's hardly surprising. Conventional academic programs are not designed to develop them and often value the opposite approach: encouraging solo research rather than collaboration, preferring data to be presented in an accepted format, measuring success according to academic merit. Ironically, the demand for new skills is coming at a time when colleges are least able to adapt and provide them because growing student numbers restrict the time available for staff to offer personalized teaching.

Degrees originated at a time when colleges were select centers of learning, to which only a minority of people were admitted. Teaching took the form of large group lectures, small seminars and individual tutorials. The personal qualities associated with a degree – independence of mind, objectivity, and the capacity for abstract thought and

reasoned debate – grew out of the ambience of the institution as much as from dedication to the study of the discipline. Nowadays, in most large universities, there are few opportunities for individual teaching. Students attend mass lectures by remote professors and large seminar groups run by poorly paid graduate assistants. Assignments are often graded with insufficient feedback to inform the student. The pervasive culture of standardized testing and multiple-choice assessment makes the process even more impersonal because the focus is on achieving performance statistics and retaining funding, rather than an interest in the individual's ability. It's little wonder that graduates lack the creative abilities that business urgently needs; or that, as the numbers of young self-employed entrepreneurs increase, fewer people are seeing the value of a university education at all.

THE WAR FOR TALENT

One of the consequences of the mismatch between education and changes in world economies is that companies and organizations everywhere are fighting a war for talent.⁹ We live in a time when the ability to adapt is critical. In situations of high uncertainty, employers need to make decisions quickly in order to steer through change. Major companies are finding it increasingly difficult to find the people they say they need. And when they do find them, they often have trouble keeping them. Executives say there is a worsening shortage of the people needed to run divisions and manage critical functions, let alone lead companies. This problem has been building for some time.

The corporate consultancy company McKinsey has been working with the human resources departments of 77 large US companies in a variety of industries to understand their talent-building philosophies, practices and challenges. Their original study, published in 1998, was updated in 2008.¹⁰ It included nearly 400 corporate offices and 6000 executives in the 'top 200' ranks in these companies. It also drew on case studies of 20 companies widely regarded as being rich in talent. Three-quarters of companies had said they had insufficient talent sometimes and all were chronically short of talent across the board.¹¹

The study concluded that executive talent has long been an under-managed corporate asset. Companies that manage their physical and financial assets with rigor and sophistication have not made their people a priority in the same way. Few employees trust employers to provide useful opportunities for professional development. Most organizations take a short-term view of training needs. Only a third of employers provide training beyond the job. In a rapidly changing environment employers constantly fear that their best talent will be poached by other companies. They are wary of investing in developing their own talent since they fear it will primarily benefit their competitors. Staff turnover is often high and vacant posts are filled with outside talent. According to search professionals, the average executive will work in five companies; in another ten years it may be seven. The recent recession is having a further impact on these trends.

To win the war for talent, most companies choose to develop powerful recruitment and retention processes to get the 'right people' on board. In 1998 this meant identifying the top 20 percent: the best performers. The problem with the short-term model is that "it does nothing to prevent the exodus of the rest – those whose talents are undeveloped. It assumes a world with an unlimited supply of talent ... that does not mind working in businesses where development is not deemed a priority." The 2008 report suggests that there has been a gradual change in this strategy and a wider recognition in companies that it is essential to maintain a balance of talent across the board.¹² Even so, according to McKinsey, companies are engaged in a war for senior executive talent that will remain a defining characteristic of the competitive landscape for decades to come. Yet most are ill-prepared and even the best are vulnerable.¹³

The underqualified

The problems are serious enough for the highly qualified. They are deadly for the unqualified. The current system is failing millions of people even by its own standards. One index measures the high rates of dropout and withdrawal from compulsory education. In the United States an average of 30 percent of students who enter the 9th grade in school will dropout before the 12th grade and not graduate from high school. In some areas the proportion is as high as 50 percent. In some Native American communities it's over 80 percent. Among those who stay the course, rates of underachievement and disaffection are often desperately high.¹⁴

It's wrong to blame the students for these numbers: they reflect a problem within the system. Any other standardized process with a 30 percent wastage rate, let alone 50 percent or 80 percent, would be condemned as a

failure. In the case of education, it isn't a waste of inert commodities; it's a waste of living, breathing people. As matters stand, those who don't graduate from high school are offered few alternatives apart from low-income work if they can find it; or long-term unemployment if they cannot. The costs of unemployment create immense burdens for the economy while very many productive jobs that could be filled are not.

In May 2010 there were 23 million people unemployed in the European Union: nearly a third of them are under 25. According to one study, "One in three Europeans of working age has few or no formal qualifications, making them 40 percent less likely to be employed than those with medium-level qualifications. In the United Kingdom alone, 5.7 million adults of working age have no qualifications at all and 20 percent of all adults in England, around 7 million people, have serious problems with basic literacy and numeracy.¹⁵ Most experts agree that the roots of Europe's jobs dilemma lie in an inflexible education system, high labor taxes and barriers to mobility.

As the 2010 report from the International Labor Organization shows, youth unemployment in particular is a global phenomenon and a deepening problem everywhere. In developed and some emerging economies, rising unemployment creates its own social hazards from the sense of alienation and prolonged inactivity. Ninety percent of young people live in developing economies, where they are especially vulnerable to underemployment and poverty. The ILO report estimates that in 2008, 152 million young people, or about 28 percent of all the young workers in the world, were in work but remained in extreme poverty; living in households surviving on less than US\$1.25 per person per day. ILO Director-General Juan Somavia says that, "In developing countries, crisis pervades the daily life of the poor. The number of young people stuck in working poverty grows and the cycle of working poverty persists through at least another generation."¹⁶

The ILO study highlights the cost of unemployment among young people: "Societies lose their investment in education. Governments fail to receive contributions to social security systems and are forced to increase spending on remedial services." As Mr Somavia puts it, "Young people are the drivers of economic development. Foregoing this potential is an economic waste and can undermine social stability. It is important to focus on comprehensive and integrated strategies that combine education and training policies with targeted employment policies for youth."

The chronically high number of jobless, roughly half of whom have been out of work for more than a year, is more than an economic challenge; the long-term unemployed are part of a broad group who feel increasingly marginalized by the driving forces of social and economic change but powerless to become involved in making a difference. These groups tend to be concentrated in particular areas: lessening their shared chances of recovery. In the UK, the vast majority of unemployed people live on 2000 housing estates. In a work-driven society, being without work or the prospect of it can produce an aggressive counter-attack.

In the United States, as in many other countries there is a smoldering problem of social exclusion. In a growing number of urban centers the problems of gang¹⁷ violence are growing, particularly among the alienated and disaffected. In major European cities gang warfare and violence have become an endemic feature of teenage life. One of the most troubling prospects is the emergence of a permanent underclass. If certain groups of inner-city residents are economically disenfranchised, they can become caught in an irrevocable cycle of crime, poverty and despair. There can be high price to pay in containing the anger and frustrations of those who feel marginalized and hopeless.

According to figures from the US Department of Justice, The United States has the highest incarceration rate of any country in the world. A report from the Pew Center in 2009 showed that a startling 1 in every 31 American adults is in the corrections system, which includes jail, prison, probation and supervision. That figure is more than double the rate 25 years ago when it was 1 in 77. During that period, prison and jail populations have grown 274 percent, to 2.3 million in 2008; while those under supervision grew 226 percent, to 5.1 million. Over the past 20 years, state spending on penitentiary systems has been the fastest-growing part of their budgets after Medicaid, the healthcare program for those with low income. In California in 2010, spending on the state correctional system was set to overtake spending on the whole of public higher education. Overall, state spending on criminal justice has increased more than 300 percent to an estimated record in 2008 of \$51.7 billion.

Of those in the corrections system, 1 in 45 are on probation or parole, with 1 in 100 in jail or prison. The numbers are concentrated among particular groups. Just over nine percent of black adults in the US are in the correctional system, about four percent of the Hispanic population and two percent of whites. Within the mushrooming prisoner populations, there are disproportionate numbers of people who failed in education, who did not complete high school or who struggled with literacy or numeracy or otherwise underperformed in education because of undiagnosed learning difficulties.

The costs of incarceration are vastly higher than education. On average, keeping an inmate in prison costs \$29,000 a year compared with an estimated \$9000 a year for high school education.¹⁸ Some policy makers clearly prefer to

meet the costs of containment rather than invest in the talents of marginalized communities. Yet, developing the talents and aspirations of those who are in trouble is by far the best way to re-engage them in society and avoid the spiraling costs of recidivism. From every point of view: social, ethical and economic, it would make vastly more sense to invest in improving education in the first place and to give all citizens a proper start in their lives rather than underfund education and spend incomparably more on the consequences.

A 1996 symposium on creativity in America concluded that the result of the misplaced emphasis on the punitive rather than on the educational roles of government is that upward mobility, a staple principle of American life, is under assault and with it “the possibility of creative reinvention of the individual … a fundamental aspect of the American imagination.” As the symposium concluded, if this comparison between investment in education and in prisons shocks us, “it should also spur us into action because it reflects a change in the nation’s priorities away from building the future and toward short-term solutions for the complex social and cultural problems we face.”¹⁹ Yet another example of the septic focus in action and its failure to treat causes rather than symptoms.

CULTURAL CHALLENGES

As technologies race forward, economies oscillate and populations shift, so too do values and behavior. Education systems everywhere now have to contend with massive waves of cultural change on every front. Some of these are the direct features of digital culture. Mark Prensky²⁰ and others make a distinction between digital natives and digital immigrants. This is not a hard and fast distinction but it does point to a significant generational shift. The proliferation of digital technologies has created what has been called the biggest generation gap since rock and roll. I often ask people at conferences to put their hands up if they are over the age of 30 and to keep them up if they are wearing a wristwatch. Usually it’s the majority. When the current over 30s were growing up, digital technology was in its infancy. To keep track of the time you had to wear a watch. If I ask a roomful of teenagers the same question, very few of them keep their hands up. As a rule the current generation of teenagers do not wear wristwatches. For them, the time is everywhere, on their cell phones, iPods and games units. They see no need to wear a separate gadget just to tell the time.²¹

“Why would you?” they say. “It’s a single function device. How lame is that?” I say, “No, it’s not, it tells the date as well.” But I know it’s not a convincing case. Teenagers and younger children speak digital as their native tongue. Most adults speak it as a second language. Our children don’t even consider these devices as technology. They are as natural to them as the air they breathe. Technology, as was once said, is not technology if it happened before you were born.

One of the consequences is that young people’s minds are constantly engaged with the digital world: they are multi-tasking, connecting and creating content at a precipitous rate. For previous generations, one of the only ways to connect with the wider world of culture and ideas was to go to school. That’s simply not true anymore. The pervasiveness of digital technology changes the whole equation for education and for the roles of teachers.

In the last 50 years many of the old certainties have also broken down; the nuclear family, patterns of religious involvement, gender roles and the rest. We live in a world in which cultural identities are increasingly complex, interwoven and contested. The growing inequalities of wealth and opportunity are opening even deeper divisions between cultural communities. In many countries, there is a worrying trend in disaffection and aggression among young people in schools. For example, in the United Kingdom statistics show that, in 2009, 17,000 pupils were excluded from schools for physical attacks on adults.²² The sense of frustration and demoralization amongst teachers is strong. Sixty percent say they want to leave the school they work in. Half of the teachers surveyed said they wanted to leave the profession because of the poor level of discipline in schools.²³

PERSONAL CHALLENGES

Young people who stay at school now find themselves under much more pressure from testing than my generation was. They work harder to get into college than we did; they work harder when they are there if they want a good result and, when they leave, their qualifications are worth less. This pressure begins when they are five, if not three, and continues throughout school. Instead of examinations and tests being an indicator of how they are progressing, they are like continually pulling up a plant to see how well it is growing.²⁴ For students who go to college, the

they are like community putting up a plant to see how well it is growing.²⁴ For students who go to college, the pressure can become more intense. As academic inflation continues to rise, students put themselves under immense pressure to succeed. Many take performance-enhancing drugs like Ritalin and Adderall to keep them focused.

In addition to academic pressure, another pressure is to appear as laid-back as possible. In a study of suicidal behavior among students, Rory O'Connor and Noel Sheehy argue that students "are under pressure to be rounded, happy, successful, talented, bright young things and they want to fit in. ...They are under pressure not to appear under pressure." More and more of them are finding all of these pressures too difficult to bear and are suffering from the consequences. The numbers of suicides at universities have highlighted the dangerously high expectations we now have for our children's academic success. Some student counselors are joining the call for schools to spend much more time on developing the basic communication and problem-solving skills that young people will need to cope later in life: "Only by getting young people to talk can we tackle the stigma associated with being unable to deal with stress and the reluctance to go to see anyone about it."²⁵

As the pressures of education continue to intensify, many students are simply not learning the personal skills they need to deal with modern life and the increased pressures of continual assessment and being examined at every level: "We have always had some form of assessment but the emphasis has shifted. By assuming that academic success is the be-all and end-all of life, we are not teaching people how to deal with the fact that they may not reach the aspiration. We don't teach people how to deal with failure and this is a fundamental oversight."²⁶

TAKING STOCK

The world is changing faster than ever and there are major problems facing all organizations in recruiting and retaining people with the creative abilities they need to engage with these changes. The lives of individuals and communities too are deeply diminished by the lack of these abilities. There are many complex factors at work, but the inherent deficiencies of industrial/academic systems of education are playing a major part. Despite the growing skills gap, the war for talent and the extraordinary pace of change on every front, many policymakers and others continue to chant the mantra about the need to raise traditional academic standards and scores on standardized tests. The reason, I believe, is that the assumptions underpinning these approaches to education have become so deeply embedded in their consciousness that many people are not even aware of them. They have blended into the everyday ideologies of common sense, as the way things have to be. Like a lot of common sense, they may seem obvious but they are wrong. The creative capacities of generations of people have been sacrificed needlessly to an academic illusion.